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ABSTRACT

The study involved selecting a group of young women at the beginning of the last year of senior high school with the potential to succeed in careers in science, and then explored whether or not they are science-bound and why. Young women who scored well on the Mathematics Section of the Preliminary Scholastic Aptitude Test could be assumed to have this potential, and a group of about 500 from a number of high schools in the San Francisco Bay Area were to be selected for in-depth inquiry. In the process of selection every effort was made to give representation to a broad variety of such factors as ethnic, socio-economic and cultural background as well as to differing school and community settings. The nature of these influencing factors and the relative importance ascribed to them by the young women and the high school faculties and administrators was to be looked at. In the focus of the study were the influencing factors that encourage young women of high scholastic aptitude to choose careers in the physical, biological and health sciences and in engineering, as well as those factors that discourage career choices in the area of the sciences. Relevant variables are current school policies and practices, prevalent community, parental and peer value systems; and socio-economic, ethnic, cultural, personality and personal background factors. (Author)

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FACTORS AFFECTING
YOUNG WOMEN'S DIRECTION
TOWARD
SCIENCE • TECHNOLOGY • MATHEMATICS

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FACTORS AFFECTING YOUNG WOMEN'S DIRECTION TOWARD SCIENCE-TECHNOLOGY-MATHEMATICS

by Barbara A. Kirk

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I. INTRODUCTION

At a National Meeting of the Science Teachers Association on November 22, 1975 Dr. Elizabeth Duncan Koontz, once head of the Women's Bureau of the U.S. Department of Labor, spoke on "The Need for Assuring Opportunities For Involvement in the Frontiers of Science for Members of Minority Groups." She stressed that women and minorities are needed in science to help insure that the sciences be responsive to human and social needs.

In stating this concept, this year, Dr. Koontz pinpointed the conceptual base of a growing social concern for decreasing barriers and deterrents to admission to these areas. A major national study, published in 1975 (10), comparing male and female recipients of doctorate degrees has found that women, often having subordinated their careers to family responsibilities, have consistently gotten lower pay, less prestigious jobs, and fewer employment opportunities. The report concludes, "women are far less likely to receive the rewards which their male colleagues enjoy. This portrait generally appears to have changed little over the past few decades, but there are signs...of recent gains."

Some change also is found by Parrish, 1974 (28) in an overview of professional training. For the years 1960-1972 he examined enrollment and graduation figures for the professions of architecture, dentistry, engineering, law, medicine, optometry, pharmacy, and veterinary medicine. The proportion and the absolute number of women students has been increasing steadily over the twelve year period, he found, and that the increase in women's enrollment is accelerating.

A measure of change over time can be derived by looking at Terman's longitudinal studies of his 1,000 Gifteds (39, 40, 41). In this group, maturing around the 1930's, only six or seven of the women (almost half of the total group) went into sciences. Progress in this respect is on the way!

Concern is international. An Edinburgh physicist in 1974 (21) argues, based on an extensive literature survey, that the most important factor in so few British women becoming scientists is that women in science are still not socially acceptable. He finds that also contributing is the bias of secondary science education towards boys.

Accepting the value for and importance to society of women's unique as well as general contribution to the science and science-related areas, more women are needed now and in the future. Gains have been, and are being made, but not to the extent to which they are needed. These gains are relatively recent, and constitute considerable improvement. However, the rate can well be accelerated, in that major social imbalance continues to exist. Hence this study.

II. DESIGN OF STUDY

The study involved selecting a group of young women at the beginning of the last year of senior high school with the potential to succeed in careers in science, and then exploring whether or not they are science-bound and why. Young women who scored well on the Mathematics Section of the Preliminary Scholastic Aptitude Test could be assumed to have this potential, and a group of about 500 from a number of high schools in the San Francisco Bay Area were to be selected for in-depth inquiry. In the process of selection every effort was made to give representation to a broad variety of such factors as ethnic, socio-economic and cultural background as well as to differing school and community settings. The nature of these influencing factors and the relative importance ascribed to them by the young women and the high school faculties and administrators was to be looked at.

In the focus of the study were the influencing factors that encourage young women of high scholastic aptitude to choose careers in the physical, biological and health sciences and in engineering, as well as those factors that discourage career choices in the area of the sciences. Relevant variables are current school policies and practices, prevalent community, parental and peer value systems; and socio-economic, ethnic, cultural, personality and personal background factors.

For this purpose the San Francisco Bay Area, consisting of five-county San Francisco-Oakland and the one-county San Jose Standard Metropolitan Statistical Areas (SMSA), offered a particularly suitable environment. Taken together, these two SMSA's encompass a population and labor force remarkable for its ethnic, industrial and occupational diversity. Because of this diversity, economic and social studies undertaken in the area have repeatedly yielded data concerning a wide range of subgroups as well as information relating to problems and developments that are significant nationwide. Within this area some six to ten high schools were to be selected on the basis of informed judgments of the likelihood that all the various socio-economic and ethnic subgroups, as well as a variety of educational policies and community settings would be reflected in their combined enrollment. The size of the population of young women meeting the criteria that we could expect to find in the selected schools could not be determined ahead of time. However, it is estimated that one, or at most two, high schools per county would yield a total group of approximately 500 young women; should this number not be reached we expected to add further high schools. This number was about the largest group that could be studied, given the time and resources available. As but two major subgroups would be differentiated - those opting at this time for and against further training in preparation for science careers - a group of 500 constituted an ample population.

In an investigation for which there are virtually no precedents, it could not be a realistic aim to attempt selecting a statistically sampled population of young women representative of the frequency with which the influencing factors would be encountered in the San Francisco Bay Area. Hence the intent was to inventory the influencing factors and obtain rough estimates of their relative incidence in the population surveyed. Attempting to assemble a demographically and socio-economically controlled sample of qualified high school young women would be unpromising for two reasons:

(1) Until the proposed problem assessment work was completed all the factors which ought to be controlled in the sampling would not be known, and

(2) Although the full range of factors influencing career choices most probably exist in the San Francisco Bay Area, it cannot be assumed that the distribution of these factors in this area is indicative of their distributions in other population centers of the U.S.

Once the relevant factors entering into the career choices of young women have been identified and very rough indications obtained of their magnitude through the present research, detailed statistical studies, preferably in several population centers, might become profitable. Meaningful and valid comparisons between these centers could then be made, possibly leading to policy decisions closely attuned to local need priorities. Thus, the chief purpose of this pioneering study was to obtain a broad perspective of all influencing factors.

Relevance of the PSAT and Use in Selecting the Survey Group

A central element in the study is the Preliminary Scholastic Aptitude Test (PSAT) published by the College Entrance Examination Board (29, 30, 31, 32) consisting of a Mathematical (M) section and a Verbal (V) section. The test is administered annually by high schools across the nation and usually taken early in their junior year (11th grade) by students intending to apply for admission to college upon high school graduation. A great deal of experience and expertise has gone into the construction and development of the PSAT by the College Entrance Examination Board and it enjoys an exceptionally high standing as regards both reliability and validity. There are yet other features that commended the PSAT for the purpose of this study. It enables students to obtain an early objective fix on their potential for the Scholastic Aptitude Test (SAT), also published by the College Entrance Examination Board, and the SAT is often the access route to college admissions and scholarships. Although taking the PSAT is voluntary and no reliable figures are available to show what proportion of the total high school enrollment does so, it is widely accepted that few college-bound students forego this opportunity to assess their capabilities. Schools that do not administer the PSAT are known to encourage their students to take it in nearby schools. Waivers of the small fee charged for taking the test are available to the economically disadvantaged.

The PSAT has unique merits. It is the only standard method of measuring scholastic aptitude in high schools across the nation. And, secondly, the vast majority of students taking it--ninety-four percent in 1973--are at about the same stage in their education and still two years removed from the earliest point in time when they are ready to enter college. During the latter intervening period there is still much room for additional factors influencing career decisions to come into play and hence for those decisions to change.

It is particularly relevant to note in this connection that attached to each PSAT form is a cover sheet asking students to state both their choice of the major subject in which they expect to enroll at college and their present choice of career.

For selecting the group of 500 young women to be questionnaired and interviewed as part of the present study, the score on the "M" section of the PSAT was to be the determining variable. Only young women having an "M" score above the national mean were to be considered for inclusion, with their score on the "V" scale as the most likely additional criterion. To secure a representation in the group of students from a variety of environments and school cultures, and for a number of other reasons related to the aims of the project, reviews and analyses of the PSAT frequency distributions in the participating schools and in the area had to be made before the criteria could be firmly and finally established.

Conduct of the Survey and Design of Survey Instruments

Our plan provided for the administration of a detailed questionnaire to all 500 young women in the prime survey group, followed by structured interviews with about five percent of them. As regards the smaller matching group of young men, a very much briefer form of questionnaire was to be administered to them for control purposes. Such areas to be included were socio-economic status (e.g., occupations of parents) and demographic characteristics, educational and occupational preference and choice.

Administration of the questionnaires was to be by groups assembled at suitable times with the help of the high school faculties and staff to cause a minimum of disturbance. Cooperation by the students concerned was to be on a voluntary basis throughout, although every effort was to be made to obtain responses from the entire group. Questionnaire responses from school personnel were to be obtained at the personnel's convenience.

The main instrument, of course, was to be pilot tested.

The basic design was to divide the group, all with aptitude for math and science, into two groups, science-bound and non-science-bound, and compare them on all variables available, objective and subjective.

The statistical treatment of the data for this exploratory study was to be relatively informal. That is, statistics were to be used as a guide in addition to informed professional judgment as to which outcomes from comparisons were likely to merit discussion. For questionnaire results chi square values were computed and for the PSAT test scale scores, $\underline{z}$ test values were computed for two-variable situations, and one-way analysis of variance $\underline{F}$ test values when more than two groups were involved. In general, probabilities of .05 or less were used as indications of significance.

III. SELECTION OF SCHOOLS

The selection of schools presented a complex problem. All potentially significant variables could in no way be accommodated within the number feasible for inclusion and within the defined geographical radius of the study. It appeared desirable to represent urban, suburban, and rural schools; a full range of socio-economic levels; and a diversity of ethnic backgrounds. Major efforts were made in this direction, but there were several constraints to achieving these objectives.

A major constraint was the necessity of including secondary schools which elected to administer the PSAT. This choice is made by a school only when sufficient numbers of students desire it, that is, when a significant portion of the enrollment is college-going. Despite endless search, this necessity eliminated schools where Chicano students are particularly numerous so that this ethnic group is not adequately represented in the study.

The other major constraint was the school's, or school district's, ability to cooperate in the study in the light of new state and district legislation and regulatory codes. The San Francisco Bay Area is a particularly sensitive area politically, reflecting the University of California, Berkeley's, leadership in protest, and subsequent activity in a number of communities around the Bay. Parents had objected to the use of students as guinea pigs, and their involuntary subjection to experimental and test procedures, and were in some instances suspicious of any procedures not indigenous to the school staff. School personnel, in turn, were acutely cognizant of parents' reactions, and desirous of forestalling difficulty.

Project staff were unprepared for the length and arduous procedures necessary to gain consent for the study and to set it up. Many problems had to be resolved despite the school administrators' reactions that this study should be popular with parents and the community and that they were in favor of it.

With the staff's previous experience and contacts with county guidance offices, a tentative selection of schools to contact could be readily made. In June of 1974 two staff members arranged appointments with principals and met initially with them and other personnel that the latter chose to include such as: Heads of Science departments, head counselors, and Vice Principals. It became clear that although they might be willing or pleased to participate, they could not do so without official approval from the Director of Research (or other title with same function) of the District. In one instance an entire committee had to act upon the request.

Formal presentation of the project was then made to the Research Director by correspondence and visit. With the number of major universities and research enterprises in the area it is not surprising that there is an inundation of requests for subjects. In at least one district ninety percent of all research requests are denied.

In the end, cooperation was secured in all schools. In a number of schools the condition was made that written consent of parents was required. It was decided that this procedure should be made uniform, and that the consent of the participants themselves should also be obtained in writing.

Only one school from the group initially selected for inclusion had to be eliminated. In that instance, the District Director required that the entire F Questionnaire be submitted to the parents for review before it was administered to the young women, a condition to which it was not possible to subscribe. Another school within the same county, but in a different district, was substituted.

Insofar as possible, schools were selected because of variations in their characteristics. For example, Berkeley High School in Alameda County is the only high school in an entire city of approximately 120,000 and all students attending public school are enrolled there. Lowell, an urban school in San Francisco, has open enrollment based upon an admission requirement of a 3.75 grade point average from junior high school, and thus draws from all socio-economic levels, all parts of the city and all racial backgrounds. Santa Clara County retains certain rural characteristics although it has become an aerospace center as well as the locus of considerable heavy industry. The other four schools in three counties are predominantly suburban, although Tamalpais High School in Marin County has open enrollment in its district and draws from areas of public housing earlier established for immigrants to Sausalito's World War II shipbuilding and repair facilities.

Under existing circumstances it was considered that the optimal selections had been made and cooperation secured. Descriptions of the communities which provide the school populations follow. Demographic and occupational data are here presented for the six counties.

ETHNIC COMPOSITION OF BAY AREA COUNTY POPULATIONS AND THE HIGH SCHOOLS IN THE STUDY

	Alameda County	Berkeley High	Contra Costa County	Acalanes High	Marin County	Redwood High	Tamalpais High
Population (a)	1,073,184		558,389		206,038		
Total Enrollment (b)		2,874		1,334		2,609	1,618
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0
White	79.8	41.4	90.0	98.0	95.9	94.4	88.9
Black	15.0	45.6	7.5	0.4	2.4	1.1	6.7
Amer. Indian	0.5	0.1	0.3	0.1	0.2	0.0	0.0
Asian	3.9	8.9	1.8	0.7	1.1	1.1	3.3
Japanese	0.9		0.7		0.5		
Chinese	1.9		0.6		0.4		
Filipino	1.0		0.5		0.2		
Korean	0.1		0.0		0.0		
Hawaiian	0.1		0.1		0.1		
Other (c)	0.7	1.5	0.4	0.0	0.1	0.0	0.0
- - - - -	----		----		----		
Span.-Amer. (d)	12.6	2.5	9.3	0.8	5.8	3.4	1.1

(a) Source of 1970 county population and ethnic distribution - Summary Manpower Indicators (Manpower Profile and Table I), U.S. Department of Labor, Manpower Administration, Region IX, June 1972.

(b) Source of school enrollment and ethnic distribution - Career Projects Basic Data Form, Table 2, with figures as reported by respondents for October 1974.

(c) The "Other" category for school entries may contain members of Asian groups that are identified separately in the census derived data.

(d) Entries for counties and schools may not be comparable as information from the schools was gathered under the heading, "Chicano." Spanish-Americans are non-additive in the county totals as they were classified as Black or White in the Census.

II. RESIDENCE-BASED EMPLOYMENT BY OCCUPATION FOR THE COUNTIES OF SAN FRANCISCO-OAKLAND AND SAN JOSE STANDARD METROPOLITAN STATISTICAL AREAS (1970) (a) (cont.)

	Alameda County	Contra Costa County	Marin County	San Francisco County	San Mateo County	Santa Clara County
Operatives Except Transport	9.9	8.9	3.5	7.3	7.2	10.3
Durable Goods Mfg.	4.2	2.8	0.7	1.2	2.9	5.9
Nondurable Goods Mfg.	2.3	2.8	0.5	2.6	1.3	1.7
Non Mfg.	3.4	3.4	2.2	3.5	3.0	2.7
Trans Eq. Operatives	4.9	3.7	2.0	2.9	3.3	2.8
Nonfarm Laborers	4.5	4.1	3.0	3.6	3.5	3.4
Service Workers	11.0	10.3	10.1	14.3	10.4	10.0
Cleaning and Food Serv.	5.4	5.0	4.5	8.0	5.0	5.4
Protective Service	1.3	1.5	1.8	1.3	1.4	1.1
Personal, Health & Other	4.3	3.8	3.8	5.0	4.1	3.6
Private Household Wkrs.	0.8	1.1	1.2	1.6	1.1	0.9
Farm Workers	0.4	0.6	0.9	0.3	0.4	1.0
- - - - -						
Numbers of Workers in Low Pay-Low Status Jobs*	9.2	10.6	9.2	13.4	9.8	10.4

(a) SOURCE: Summary Manpower Indicators (Table 9 in releases for counties), U.S. Department of Labor, Manpower Administration, Region IX, June 1972.

(*) This category of workers includes nonfarm laborers; farm laborers and foremen, and private houshold workers.

II. RESIDENCE-BASED EMPLOYMENT BY OCCUPATION FOR THE COUNTIES OF SAN FRANCISCO-OAKLAND AND SAN JOSE STANDARD METROPOLITAN STATISTICAL AREAS (1970) (a)

	Alameda County	Contra Costa County	Marin County	San Francisco County	San Mateo County	Santa Clara County
Total-All Occupations	416,760	211,006	80,620	318,311	241,036	409,077
Percent	100.0	100.0	100.0	100.0	100.0	100.0
Prof, Tech. & Rel.	17.8	18.4	24.3	17.6	17.2	23.9
Engineers	1.8	2.7	2.8	1.2	2.3	5.0
Med. & Health	2.4	2.5	3.9	3.5	2.6	2.6
Teachers, El. & Sec.	3.1	3.4	4.1	2.4	2.7	3.6
Other Prof. Wkrs.	10.6	9.8	13.5	10.4	9.6	12.6
Nonfarm Mgrs. & Adms.	8.0	10.8	14.9	7.9	10.9	9.2
Salaried	6.6	9.0	12.6	6.4	9.3	7.8
Self-employed	1.4	1.7	2.3	1.6	1.6	1.4
Sales Wkrs.	7.4	8.7	11.5	7.1	9.3	7.8
Retail Stores	4.1	4.4	4.5	3.7	4.6	4.1
Other Sales Wkrs.	3.3	4.3	6.9	3.5	4.7	3.7
Clerical Workers	21.8	18.2	19.8	29.0	22.7	18.2
Secty's, Stenos & Typists	5.7	4.9	6.1	8.5	6.6	5.6
Other Clerical Workers	16.1	13.3	13.7	20.4	16.2	12.6
Craftsmen, Foremen & Rel.	13.6	15.1	9.0	8.5	13.9	12.4
Construction Craftsm.	3.1	4.2	2.7	1.9	3.0	3.0
Mechanics & Repairmen	3.6	3.2	2.0	1.6	4.1	3.0
Machinists & Other Crfts.	1.5	1.3	0.4	0.6	1.3	1.4
Other Craftsmen	5.4	6.3	3.9	4.3	5.6	4.9

ETHNIC COMPOSITION OF BAY AREA COUNTY POPULATIONS AND THE HIGH SCHOOLS IN THE STUDY (cont.)

	San Francisco County	Lowell High	San Mateo County	San Mateo High	Santa Clara County	Camden High	Homestead High
Population (a)	715,674		556,234		1,064,714		
Total Enrollment (b)		2,655		1,952		1,713	2,145
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0
White	71.4	37.0	91.3	83.3	94.3	89.6	93.5
Black	13.4	7.6	4.7	6.4	1.7	0.9	0.7
Amer. Indian	0.4	0.1	0.2	0.1	0.4	0.5	0.0
Asian	13.4	40.4	3.1	5.3	3.0	1.5	2.0
Japanese	1.6		1.0		1.6		
Chinese	8.2		1.0		0.7		
Filipino	3.4		1.0		0.6		
Korean	0.2		0.1		0.1		
Hawaiian	0.1		0.1		0.1		
Other (c)	1.1	7.8	0.6	1.7	0.6		0.6
- - - - -							
Span.-Amer. (d)	14.2	7.1	11.3	3.2	17.5	7.5	3.2

(a), (b), (c), (d) - See first page.

III. ESTABLISHMENT-BASED NON-AGRICULTURAL WAGE AND SALARY, ESTIMATED EMPLOYMENT BY INDUSTRY, AND AGRICULTURAL EMPLOYMENT FOR THE COUNTIES OF THE SAN FRANCISCO-OAKLAND AND SAN JOSE STANDARD METROPOLITAN STATISTICAL AREAS (in thousands, annual average for 1974) (a)

	Alameda County	Contra Costa County	Marin County	San Francisco County	San Mateo County	Santa Clara County
Total Non-Ag. Wage and Salary Empl.	432.3	145.9	54.2	483.6	204.6	469.6
Mineral Extraction	1.0	0.3	----	0.4	----	0.1
Construction	16.3	8.6	2.8	19.9	9.0	19.9
Manufacturing	86.0	26.5	3.8	50.0	30.0	158.9
Durable	54.5	12.1	2.6	11.9	19.6	132.6
Nondurable	31.5	14.4	1.2	38.1	10.4	26.3
Trans., Comm. & Utils.	32.7	10.1	2.5	52.5	30.2	19.0
Trade	95.2	36.4	13.9	92.9	51.9	88.8
Wholesale	27.1	6.4	1.5	37.8	17.0	19.3
Retail	68.1	30.0	12.4	55.1	34.9	69.5
Finance, Ins. & Real Estate	21.7	6.4	3.5	69.4	10.1	17.9
Services	73.5	24.5	13.8	110.3	39.8	94.0
Government	105.9	33.1	13.9	88.2	33.6	71.0
- - - - -						
Agriculture	2.4	0.8	1.0	----	2.3	6.1

(a) SOURCE: Area Manpower Reviews - San Francisco-Oakland and San Jose Standard Metropolitan Statistical Areas, California Employment Development Department, Northern California Employment Data and Research, March 1975.

IV. ENROLLED CHILDREN FROM FAMILIES RECEIVING AID TO FAMILIES WITH DEPENDENT CHILDREN (AFDC) AS A PERCENT OF TOTAL PUBLIC SCHOOL ENROLLMENT BY COUNTY, (1972/73)

County	Total Enrollment (a)	Percent AFDC Children of Total Enrollment
Total	906,648	13.63
Alameda	233,739	16.08
Contra Costa	144,397	12.06
Marin	44,086	4.74
San Francisco	75,892	34.39
San Mateo	117,630	8.11
Santa Clara	290,904	10.59

(a) Combined elementary and secondary public school enrollment. Excludes post-secondary enrollment.

Source: Annual Report of Financial Transactions concerning School Districts of California for Fiscal Year 1972/73 - State Controller's Office and unpublished school district data from the California State Department of Education, Entitlement and Reports Unit.

The five-county San Francisco-Oakland Standard Metropolitan Statistical Area together with the neighboring San Jose Area (which is coterminous with Santa Clara County) offers the investigator a rich diversity of socio-economic characteristics for sampling purposes. Together, these six counties circle San Francisco Bay and extend into the large interior valleys that stretch east and south of the hill-rimmed harbor. Its terrain insures that this area's more than four million inhabitants will be employed in a multiplicity of enterprises.

San Francisco County

San Francisco County serves as the "headquarters city" for the entire Bay Area. Because of a daily influx of commuters, it can rank as the area's county of largest employment though not of population. The nature of this employment, predominately of the white collar variety, reflects San Francisco's status as a financial and administrative center. As is rare in patterns of industrial distribution, five industry groups exceed manufacturing in volume of employment - services; trade; government; finance, insurance and real estate; and transportation.

Concurrently with San Francisco's preeminance as a financial and administrative center, the resident labor force possesses many characteristics associated with those of inner cities. Of all the counties included in this study, San Francisco has the highest proportion of its school enrollment (thirty-four percent) from homes receiving assistance under the Aid to Families with Dependent Children Program (3). Census figures for 1970 show it to have the lowest percentage of Caucasians in any of the six counties (seventy-one percent) while its population includes a substantially higher proportion of Asians (thirteen percent) than does any other. Also, it is in second place in both its proportion to total population of Blacks (thirteen percent) and of Spanish Americans (fourteen percent).

It is not surprising that our sample of the student body at Lowell High, the San Francisco school included in this study, should exhibit quite different characteristics than the samples drawn from other schools. The variance stems from several factors. First are the ethnic and economic characteristics of the community which this school serves,with its above average proportion of ethnic minorities and of the financially hard-pressed. Second is the fact that the school draws its enrollment city-wide from among those students meeting its admission requirements for high scholastic achievement. And it can be inferred that the nature of the local labor market itself,with its perennial shortage of professional and technical workers and equally permanent surplus of lesser-skilled, industrial-type workers,offers a strong incentive to those who are upwardly mobile to compete for admission to this school.

Thus we find Lowell students from homes reflecting both extremes of the socio-economic-educational range and, not unexpectedly,showing an ethnic distribution in its total enrollment of forty percent Asian, thirty-seven percent White, eight percent Black, and seven percent Chicano. Further, we find represented among our sample of students both those who come from homes where the wage earner occupies a high-level professional or administrative job, and from families in straitened circumstances. The number of these latter is sufficiently great that San Francisco, despite the affluence of many, has the highest proportion of persons "in poverty" (38) and the largest percentage of workers in "low pay-low status" jobs of all the counties included in this study.

Alameda County

Alameda County, on the east side of the San Francisco Bay, has an industrial pattern which differs appreciably from that of San Francisco. Government, including the schools, employs more workers than does any other major industry division. A substantial proportion of these government workers, however, are employed by large industrial-type (chiefly military) installations or are in lesser-skilled jobs. Also, manufacturing is almost twice as important to this county's employment as it is to San Francisco's. The occupational distribution of employed Alameda County residents, therefore, does not differ as much as might be expected from that of San Francisco's resident labor force.

The City of Berkeley constitutes a sort of enclave within Alameda County in terms of the industrial and occupational distribution of its employment. Where eighteen percent of all Alameda County workers are employed in professional and technical occupations (very near the San Francisco proportion) thirty-seven percent of Berkeley's workers are in this major occupational group. Balancing this average are distinctly fewer Berkeley workers, proportionately, in the skilled, semiskilled, and unskilled occupations than in the county as a whole. Berkeley's occupational structure, of course, reflects the presence in the city of the University of California and the many other educational institutions, research facilities, and professional services customarily attracted to a university town.

Alameda County, after San Francisco, has the second lowest proportion of Caucasians (eighty percent) of any of the counties whose schools are included in this study. Of all these counties, its population includes the highest proportion of Blacks (fifteen percent), the third highest of Spanish Americans (thirteen percent), and a relatively insignificant proportion of Asians (four percent). Berkeley High, however, the single high school serving the entire city, reports an ethnic distribution showing a considerable difference from that of the County in its entirety. Whites comprise but forty-one percent of this school's total enrollment, while Blacks account for forty-six percent, and Asians for nine percent.

Contra Costa County

Contra Costa County borders Alameda County on the north. Its extensive shore line around the Bay and along the Carquinez Straits has long been a manufacturing center characterized by such process industries as chemicals and petroleum, and by primary metals. In recent years the county's large areas of open land have given way both to the promoters of light industrial development and to the subdivider. Therefore, figures showing the overall occupational distribution of the county's work force adequately reflect neither the heavy concentrations of industrial occupations to be found in its older cities nor the predominately white collar characteristics of its new suburbs.

Acalanes High, the Contra Costa school chosen for this study, is located in an upper middle class suburb where local employment opportunities are largely restricted to the services and trade major industry divisions. Out-commuting is heavy to professional, technical and administrative jobs at establishments located elsewhere in Contra Costa County or in Alameda and San Francisco Counties.

The ethnic distribution of the Acalanes student body reflects its suburban locale rather than the more heterogeneous population of the county as a whole. Of its total enrollment, ninety-eight percent of the students are White, with Blacks, Asians and Chicanos registering only fractional percentages.

It is reasonable to surmise that county-wide figures showing Contra Costa as the third highest county among the six in terms of the proportions of students from homes receiving Aid for Families with Dependent Children (twelve percent) and second highest in the percentage of its workers holding "low pay-low status jobs" (eleven percent) are as little applicable to the Acalanes student body as are figures showing the ethnic distribution of the county's total population.

Marin County

Marin County, north of San Francisco across the Golden Gate Bridge and separated by a major arm of the Bay from Contra Costa, is the prime example of a "bedroom area" among the six in which the surveyed schools are located. Census figures for 1970 showed fewer than half of its workers employed in their county of residence (1) with this proportion falling to near a third in several communities. At the same time, the proportion of professional, technical and managerial workers in the county's resident work force (twenty-four percent) is higher than in any other of the six included in this study. At the other end of the occupational spectrum, the percentage of private household workers to all workers ranks below that of only San Francisco and, reflecting the amount of land that remains undeveloped in this county, the proportion of farm workers in the total work force is second only to that of Santa Clara County (the San Jose Standard Metropolitan Statistical Area).

Marin County's total population is ninety-six percent White with but two percent of the total Black and a fractional representation of Asians. Six percent are Spanish Americans reflecting largely the still significant amount of agricultural activity in this county.

One of the schools surveyed in this study, Redwood High, very nearly mirrors the county's ethnic distribution. The other, Tamalpais High, varies slightly with its higher proportion of Blacks (seven percent) than is to be found county-wide. This variance follows from the fact that the children of families residing in Marin's public housing projects, dating from World War II, are very largely enrolled in this school.

San Mateo County

San Mateo County, immediately south of San Francisco, long shared Marin County's characteristic of being primarily a "bedroom area" for its larger neighbor. This fact remains evident in its being, after Marin, second among the six surveyed counties in the smallness of its proportion of workers employed in their county of residence (fifty-five percent).

In recent years, however, the county has developed a sizeable industrial base of its own. Manufacturing employment has grown, primarily in the production of electronics components, an activity requiring a large proportion of professional, technical and highly skilled workers. The location and steady expansion of the San Francisco Airport in this county has created an important transportation and shipping complex which offers many industrial-type job opportunities besides those in manufacturing, in aircraft maintenance and repair, and also in wholesale trade.

San Mateo County, including as it does, both islands of suburbia and its own industrial base, exhibits an occupational structure that is very close to the average for the five county Bay Area as a whole.

Unlike San Francisco and Alameda Counties, however, its population remains more than ninety percent Caucasian in its ethnic origins, with but minor representations of Blacks (five percent) and Asians (three percent), and with Spanish Americans the most important minority group (eleven percent).

San Mateo High, the school selected for study departs slightly from the overall county pattern. The City of San Mateo is less a typical suburban town and more proximate to the county's center of employment than are many other communities in this area. Thus the school's enrollment includes a slightly lower proportion to total of Caucasians and Spanish Americans, and a higher proportion of Blacks and Asians than is to be found county-wide.

Santa Clara County

Santa Clara County, at the southern end of the San Francisco Bay, borders both San Mateo and Alameda Counties. It is the most rapidly growing of all counties in the vicinity of San Francisco Bay and differs appreciably from its neighbors in several important respects. In an area previously, and even at present, noted for its agriculture and agriculture-related activities, manufacturing now comprises, as is true of no other Bay Area County, the largest single major industry division. Disregarding the still substantial nondurable manufacturing component with its important food processing employment, it is manufacturing with a difference. The durables group is heavily weighted by workers in the aerospace industry - ordnance, electrical machinery, and instruments - all insatiable users of professional, technical, and skilled personnel.

In consequence, the county's resident work force shows a proportion of professional and technical workers (twenty-four percent) that is second only to that of Marin and then only fractionally lower. Further, more of this group of workers are in engineering occupations than is the case in any other of the surveyed counties. And of all the counties, the largest proportion of workers are employed in their county of residence (eighty-three percent).

Santa Clara County departs from the norm of Bay Area Counties in having somewhat lower proportions of clerical and sales workers in its occupational pattern. Also, reflecting the comparative importance of manufacturing and agriculture, the proportion to total of semiskilled workers and farm workers is somewhat higher than is that shown in the five-county average.

The county follows Marin in the preponderance of Whites (ninety-four percent) in its population, with a proportion of Blacks (two percent) that is even smaller than that of Marin. Santa Clara County, however has the highest proportion of Chicanos (eighteen percent) in its total population of any Bay Area County and a small representation of Asians (three percent) as well.

The two Santa Clara County high schools selected for study, Camden and Homestead, both reflect the basic characteristics of the county in their student bodies. Both are preponderately White as to their ethnic distribution, and neither is more than one percent Black or two percent Asian. The proportion of Chicanos in each school, however, is well below the high proportion characterizing the county as a whole, for this group is more likely to be found in the City of San Jose and the outlying areas than in a suburban environment.

The Homestead student body is drawn from an affluent suburb and only three percent of the total enrollment is Chicano. Officials at this school report that eighty-five percent of their students will go on to college following graduation, except for Lowell High in San Francisco and Redwood in Marin, the highest proportion of any of the schools in this study.

At Camden High, located in a "middle-level" suburb, eight percent of the total enrollment is Chicano, the highest proportion for this group of any school whose students were sampled. A somewhat lower level of educational expectations characterizes Camden as well, when compared to Homestead. At the former, seventy-five percent are reported as college-going with more than half, as at Homestead, planning to enter a two-year college.

IV. SAMPLE

The Preliminary Scholastic Aptitude Test/National Merit Qualifying Test (PSAT) is offered by the College Entrance Examination Board and the National Merit Scholarship Corporation, and administered by Educational Testing Service (ETS). "The PSAT can help you assess your ability to do college work, evaluate your plans for college, and, if you are a high school junior, choose your senior-year courses. If you are unfamiliar with timed tests made up of multiple-choice questions, the PSAT will give you experience with such tests. It will also give you a good idea of what to expect when you take the College Board Scholastic Aptitude Test (SAT) which many colleges and universities require of some or all of their applicants (31)."

The PSAT administration upon which this sample selection was based was held nationally on October 23, 1973, in public, independent and parochial secondary schools that register to test their students. Customarily schools administer this test on their own campuses by their choice if they have a fair-sized college going population. If they do not administer it, they arrange for their students to be admitted to a school which is registered for the test as close as possible geographically.

In 1973,115,795 students took the PSAT, of which ninety-four percent were high school Juniors. ETS developed norms for this form via this administration by sex, irrespective of school year.

The Mathematical Section of the PSAT is described as follows: "Some questions in the mathematical section require you to apply graphic, spatial, numerical, symbolic, and logical techniques to situations already familiar to you; these may be similar to exercises in your textbooks. In other questions you are presented with novel situations and are called upon to do original thinking and to solve problems. You will not be expected to use mathematical knowledge beyond elementary algebra and geometry." It was hypothesized that this measure of analytical and numerical ability would demonstrate aptitude for science, mathematics and technology at some level.

In order to establish criteria for the selection of the sample of young women for this study, the complete PSAT rosters for the eight schools in the study were scrutinized. The first decision was to eliminate all sophmores and seniors in order that the group would be a homogeneous one of only tested juniors who would then be seniors at the time of the study. The remaining questions had to do with establishing a cutting score on the Mathematical scale, and deciding whether the Verbal score should be taken into account. Tabulations resulted in the plan to rely on the simple criterion of the Mathematical scale scores, since generally the verbal scale scores were quite similar, with only a few disparities likely due to bilingualism. Intercorrelations have been found to be in the neighborhood of .70 (30). The condition that the young women have aptitude for math and science would seem to be satisfied.

In order to allow adequately for inevitable attrition, a cutting score was selected which would include a total of close to 600 young women. The score was 46, equivalent to the 80th percentile on national girls' norms, and thus including the upper twenty percent of young women taking the PSAT. These young women were therefore in effect already selected by their plan for college going, and concern for SAT effectiveness, suggesting the consideration of a selective four year institution. All young women in the eight schools were included in the first lists, a generally very superior population.

The young men's sample was based on the same cutting score of 46. In the young men's case this was equivalent to the 71st percentile, including the top twenty-nine percent. Since a sample of only 100 was to be selected, for expediency the number of schools included was reduced to five, distributed through five of the six counties: Berkeley, Acalanes, Redwood, Lowell, and Homestead. Every fourth qualified young man on the roster in each of these schools was included in the original list.

The original lists of eligible young women numbering 617 were checked out with the schools. Forty-six were no longer enrolled and were not attending school, leaving 571. Separate lists were constructed by school, and the school supplied with an explanatory letter to the parent, with opportunity for signifying voluntary participation on the part of both parent and daughter.

CAREER PROJECTS
2150 Shattuck Avenue, Suite 903
Berkeley, California 94704

Dear Parent,

This letter is to request your cooperation, as well as your daughter's, in a National Science Foundation supported study of a sample of young women in a number of Bay Area high schools who performed particularly well on the Preliminary Scholastic Aptitude Test.

Our project has already been approved by the Research Director of your school district and by the Principal of your daughter's high school. Every precaution will be taken in handling and presenting our data to insure the confidentiality of all individual responses gathered in this survey.

Because of the special aptitudes she showed in this test, we would like your daughter to complete a questionnaire about her educational and occupational preferences and the factors that influenced her in shaping them. A subsequent interview of about one in every twenty of those completing the questionnaire is also planned.

This study has grown out of an increasing concern, both governmental and private, that outstanding young women be given appropriate career attention. We believe that its findings will assist educators and guidance people in designing programs directed to this end. Therefore, we will very much appreciate your signature and your daughter's on the form below and its return within the next few days.

Sincerely,

____
Project Director

- -

I give permission for my daughter to participate in this study.

(Parent's/Guardian's signature) ______________________________

I am willing to participate in this study.

(Student's signature) ____________________________________

Attached to the letter was a half sheet drafted by this project, addressed to the student, requesting the young woman to take the parent's letter home, and giving directions when and where to return it. To put as little burden on the school as possible, the young woman's name was typed by the project in the upper left hand corner:

CAREER PROJECTS
2150 Shattuck Avenue, Suite 903
Berkeley, California 94704

Dear Student,

We hope that after reading the attached letter to your parents you will want to participate in our study about careers for outstanding young women. We need and will very much appreciate your cooperation because each young woman selected is very important to our study.

If you will participate, please take the letter home and obtain your parent's or guardian's signature which is required by school regulations. Then, add your own signature, and return the letter to __________ not later than __________.

Sincerely,

____
Project Director

The schools distributed these letters in a variety of ways, depending upon their operational procedures. Ordinarily a period of two to three weeks was required to secure the majority of returns, and to plan by conference to follow-up the stragglers, although most were very promptly returned.

Extremely few parents withheld permission, and those three or four, according to the counselors, were because of family turmoil. For example, in one family there had been a very recent central death, and the counselor's hypothesis was that energies were so depleted that one more new thing could not be coped with. Generally, the parents gave evidence of being pleased and eager, in a few instances telephoning or visiting the project office to obtain further information.

More young women declined than parents. Thirteen of the eighteen were at Lowell High School. The Dean of Girls with whom most of this group voluntarily discussed their withdrawal, reported an interesting observation. She said that typically these were pretty, attractive Chinese young women accompanied by a boy friend. Her impression was that this was a demonstration of a cultural pressure away from female career ambitions. Of the five from other schools who declined, two were Chinese.

Approximately 549 young women remained in the potential sample. The further attrition was due to two primary factors:

(1) At the time of the data collection the young woman was unavailable, e.g., on a trip abroad, ill and absent, or had moved.

(2) The young woman literally was unable to find or afford the time. Three questionnaires which had been started were discarded because these young women were never able, literally, to find the time to complete them. The young women in this sample, particularly, are very busy. Many of them split school lives with jobs and/or volunteer activities. Many had such heavy and complicated school programs that it was unfeasible for them to miss classes or find time before or after school to complete their questionnaires.

The objective was to secure a sample of 500 young women above the PSAT Q cutting score. The final count, which appears to be relatively free, within the confines of the design, of any major bias, is as follows:

Berkeley	89
Acalanes	37
Redwood	71
Tamalpais	28
Lowell	151
San Mateo	37
Camden	18
Homestead	69

The total, 500, fell as such, serendipitously!

A preliminary survey of the data showed that only seventy-five of the total 500 young women did not entertain the idea of any science, technology, or math related major or career at any level, even as an outside choice. This appeared reasonable validation of the hypothesis that strong quantitative ability was related to consideration of science and that use of the PSAT Math score was a meaningful selection criterion. Further, these seventy-five young women differ from the others in being higher verbally than quantitatively, a difference significant at the .05 level. Various means and standard deviations for both scales are given later in the study.

In the case of the young men, considered a base rate data group for control purposes, the PSAT cut-off score established a larger initial pool of subjects, and less intense care was taken to secure a questionnaire for every available individual. Rather, an effort was made only to secure a sample of 100 young men distributed among the five schools.

The procedure was similar in securing young men's consent, although it was agreed that it was not requisite to obtain that of parents. The following statement, adapted to each school, was sent by the school to the young men on the list:

> Career Projects, funded by the National Science Foundation, which has been studying young women with high aptitude for math and science, would like also to study a small group of young men. You have been selected, and, if you are willing to complete a short questionnaire, it should only take fifteen minutes.

The final sample was as follows:

Berkeley	24
Acalanes	18
Redwood	27
Lowell	21
Homestead	12
Total	102

V. INSTRUMENTS

All general research instruments were designed jointly by the project director and associate, working together over the summer of 1974.

The Student Questionnaire - F (for female), numbering twenty-six pages in its final form, was the one which was most time-consuming in its development. The intent, in keeping with the purpose of the study, was to include all variables which might differentiate or be related to movement towards or away from science in the young women who had the capacity for science and math. Accordingly, drawing upon both experience and research knowledge and background in areas of psychology and labor economy, known characteristics of scientists, technologists and mathematicians were considered, as were those related to sex differences. Effort was made to avoid possible perception of questions as being objectionable to either parents or students.

After a first revision by the developers, consultants were utilized. First, the Research Director and Head Counselor in one of the closest high schools included in the study, both highly competent, were asked in interview to review and comment, as was the Dean of Girls at another school. Incorporating their suggestions, the questionnaire in this stage was sent to all district Research Directors and all Head Counselors of schools participating in the study. Some helpful reactions were received by mail or telephone.

The last step was try-out. For this purpose voluntary subjects were obtained who matched the experimental group but were attending schools in the area not part of the study. One was a private, one a public school. The private school's young women were appreciative of the opportunity, since no counseling in any form existed in the school. They regarded the experience of completing the form as a chance for self-examination, as exposure to a counseling tool. The last item in the questionnaire indicated that this was the case for some of the experimental group, and it was found in interviews that this was experienced by at least one girl who articulated it subsequently. Additionally, one subject was obtained who met the requirements, except that she was a senior when she had taken the PSAT, and had graduated in June 1974. Each try-out was timed.

A few accommodations were made as a result of the young women's suggestions, and the final form prepared. A copy is located in Appendix B, as are copies of all other instruments.

The young men's questionnaire, Student Questionnaire - M (for male), was an abbreviated form of the young women's, and contained those items from the F Questionnaire which seemed most critical and likely to differentiate general student reaction from that due to sex differences.

Several other types of data important to the study were also collected in various forms (see Appendix B).

The Basic Data items were those which appeared most likely to characterize the socio-economic and ethnic characteristics of the schools.

The Counseling and Guidance Program, Counselor, Occupational Information Specialist and Work Coordinator questionnaires were designed to have items which could be compared with data previously gathered in the same geographical area, and within the context of comprehending components of the school's counseling, guidance and occupational information programs in case significant differences should appear between schools.

In the same context, understanding each school's instructional program in mathematics and science was deemed appropriate. Professional and accrediting organizations were consulted regarding criteria for personnel qualifications.

PSAT items analyzed in this study are to be found in Appendix A.

VI. DATA COLLECTION

Student Questionnaires

The F Questionnaire, the primary data for the study, was administered in the eight schools in almost as many different situations and settings as there were schools. Almost always the young women were afforded different options in periods or time sequence, to make completing the questionnaire as convenient as possible. The project director personally handled all group administrations, sometimes with an assistant as the situation warranted. At least two visits to each school were required to obtain the needed complement, and occasionally questionnaires were left for follow-up administration by the Head Counselor or his designate. Young Women's requests to take the questionnaire home were not subscribed to, since there would be no control in terms of the input.

In one instance, there are some twenty-seven "mod" periods in the day, averaging some eighteen minutes each. Since the questionnaire required thirty or so minutes to sixty or so, the project director was given a classroom in each instance in which to spend the day. The young women came as they could, and in a number of instances had to make two or even three trips to complete the questionnaire.

It was apparent from observation at all administrations that the subjects took the project seriously and tried to respond appropriately and accurately. A few stated that they wished they had had more time to think, because some of the questions were provocative for them.

F Questionnaires were completed primarily in October 1974, and the remainder in November 1974. The procedure for M Questionnaires was analogous, except that ordinarily one trip to each school sufficed, with the follow-up administration handled by the head counselor or his designate. The M Questionnaire responses were obtained in early December 1974, before vacation, and in January 1975.

The instruments for school personnel were presented by various means, and at various times during visits to the schools.

Basic Data Sheet

Conferences were required to determine which, or which combination of, administrators would have best access to data. Principals, Vice Principals, Registrars, Head Counselors and their staffs were involved in supplying this information.

Counseling and Guidance Program

This questionnaire was given to the Head Counselor, usually the chief contact for the project. The Head Counselors all had heavy administration duties, but somehow managed to give their thinking, despite the questionnaire's formidable appearance. These, as subsequent instruments, were spread over time for their distribution and return, from November to April.

Occupational Information Specialist

In general, these respondents were the most enthusiastic, desiring interaction with the project. The individuals in question varied by training, discipline and role.

Work Coordinator

As with the Occupational Information Specialist, there was variation in whether the questionnaire was given directly by the project director or by the head counselor. Unlike the Occupational Information Specialist, the Work Coordinator was hard to find, often being out in the field, sometimes working out of the district office rather than the school.

Science and Mathematics Department Heads

In each school there was a designated, separate head of each department. Again, the method and timing of presenting these questionnaires differed by school, varying between direct presentation by the project director, through the offices of the school designated liaison, Principal, Head Counselor, Dean of Girls or Science Teacher.

Counselors and Math-Science Teachers

The distribution of these questionnaires was accomplished by the school. Wherever possible, teacher lists were obtained in advance, and an attempt to personalize was made by typing the name on the questionnaire. In order to provide for confidentiality if desired within the school operational framework, a localized version of the following half-slip was attached to each questionnaire.

For purposes of the NSF supported Career Project in which ____________________ has been selected to participate, we will very much appreciate your filling out this brief questionnaire. It should be returned in a sealed envelope to ____________________, who is collecting the questionnaires for us. We will appreciate your candid opinions.

Sincerely,

Barbara A. Kirk
Project Director

CAREER PROJECTS
2150 Shattuck Ave.
Suite 903
Berkeley, California 94704

Completed staff questionnaires were either collected on one of the subsequent visits to the school, or were returned by mail. In a number of cases, reminders were required by telephone or mail, or a new form was needed to replace a lost or misplaced one.

VII. EDUCATIONAL AND OCCUPATIONAL CLASSIFICATION SYSTEMS

Several research problems were encountered which led to the development of two major instruments for the purposes of this study. These instruments may be fruitful in themselves in studying science-technology-mathematics orientation under other circumstances.

First, if the codes used by the PSAT for educational and occupational choices were to be compared with the expressions of choice appearing in the present study, the PSAT coding system would have to be in some way incorporated into the broader classification system required for this project.

Secondly, this broader classification system was required because of subtler influences on the students. A classification system was desired which would also encompass their parents' education and occupations, covering a much fuller range than the ones projected for the students. In effect, a system was needed that would encompass the sparse and generalized choices offered by the PSAT, the students' open-ended future choices a year later, and the far broader spectrum of the parents' accomplished status.

In the latter regard, there was one further aim. Because any student exposure to any of the fields of focus, at whatever level no matter how peripheral, might be developmentally significant, it should be capable of analysis.

Finally, after reading through the completed F Questionnaire and on the basis of past experience, the project director developed the hypothesis that in relation to interest and personality characteristics, the biological sciences concerned with plants, animals, and the environment are different qualitatively from those concerned with humans. This is in accord with factor analysis of interest inventories, especially the Strong Vocational Interest Blank (SVIB). Further, to highlight important psychological distinctions among the physical sciences, technology, and mathematical fields, different categorizations were required from those which were used in major general occupational-industrial classification systems, such as the Census, Dictionary of Occupational Titles, etc. The need was for a full elaboration of the fields which were the focus of this study.

Dr. Margaret Thal-Larsen was largely responsible for the construction of these two special instruments which can be found in Appendix B. The rationale of their construction follows and the reader will find it helpful to refer to the instruments as they are discussed.

As stated above, the special requirements of this study necessitated developing a classification system for Occupation and for Education that would meet various specific needs.

The Occupational Classification System

The matter of Occupation, like that of Education, is central to this study and it appears in several contexts. As examples:

1. Both the young women and the control group of young men were asked the occupations of their parents. Because of the size of the student sample and the efforts made to include respondents from a variety of socioeconomic backgrounds, it could be assumed at the outset that a wide range of occupations (both as to field and to level) would be reported. Further, it could be assumed (a) that subsequent analysis of the data obtained from these questions would require identification of the reported occupations at the detailed level, and (b) that it should be possible to consolidate these detailed occupations into major occupational groups that, in turn, could be related to other available data describing the occupational distribution of employment in communities and, possibly, in larger geographic entities.

2. Both the young women and the control group of young men were asked about "career plans." It could be assumed that the answers to this question would not cover as broad a range of occupations as would the answers supplied for parents. Nonetheless, the potential range was expected to be considerably larger than the comparatively limited list of occupational choices previously presented to the students in the PSAT. Here, it could again be assumed that subsequent analysis of the data obtained from the answers to these questions would require an identification of occupations at the detailed level, and the capability should exist for consolidating the detailed occupations into major groups comparable to others more generally used. At this point it was also necessary to "embed" those occupations listed by PSAT into any structure devised for purposes of this study. This had to be done in order that the occupational choice indicated on the PSAT by the student at the time he or she took the test could be (a) coded and entered on the identifying information for each student and (b) readily compared as to its stability or lack of stability in terms of the choice recorded at the time the present study's questionnaire was administered.

3. Each young woman was asked if her father and her mother would like her "to aim for a particular job or career" and "If yes, what job or career?". Quite obviously, data obtained from these questions, for purposes of analysis, would require the same classification system as that utilized for other data involving occupations.

The requirements listed to this point precluded use of the several categorizations of occupations that have been developed by educators and others in connection with theories of vocational development. Also, use of the Dictionary of Occupational Titles (DOT) classification structure was precluded if data from the study were to be comparable with those developed for specific geographic entities. However, the census list of detailed occupations (although not the census major occupational groupings) were equally unusable unless substantially modified.

The census subgroups had to be reordered in a different sequence if detailed occupations were to be associated in clusters indicating their status as occupations in science (and, if so, the type of science); in mathematics; in technology; or as sharing in some measure the setting, training or other characteristics of an occupation in science, mathematics, and technology; or as an occupation that had very little or no relationship to science, mathematics and technology.

This element was required in the classification system if certain features of the research design were to be accommodated. Among these was the hypothesis that the occupations of parents constituted an influence upon the survey subjects that had a potential either to encourage or discourage the student regarding a career in science, mathematics and technology. Also, the specific occupational choice of the student (or the occupations under consideration if no choice had been made) was to be one of the criterion measures of determining whether or not the subject was "science-bound".

A five digit occupational classification system was devised that could serve these various requirements.

The first digit of the five digit code for a detailed occupation - as, for example, Agricultural Engineer - indicates the level of the occupation. As this occupation falls into the professions, the first digit, denoting the major census occupational group, is "0" - "Professional Technical and Related Workers." It should be familiar to users of the Dictionary of Occupational Titles in this connection.

The second code digit indicates the major field of the occupation, in this instance, "Scientists - Plants, Animals and Related Life Sciences," a field identified also by the digit "0". Second-place digits "1" through "4" denote other fields of science, mathematics and technology, (e.g. Scientists and Practitioners - Human Medical and Related Life Sciences; Engineers and Architects; Mathematics, Statistics and Computer Science). Meanwhile "5" used as the second digit through the technician level (or the digit "7" for subsequent levels) denotes occupations that are carried on in a scientific, technical, or mathematical setting or are, themselves, related to such activities in their subject matter or in their use of techniques as methodologies (e.g. Accountant, City Planner or Technical Writer). An "8" in second place is reserved at all levels for occupations that can be construed, sometimes quite arbitrarily, as non-scientific (e.g. Political Scientist, Actor, Journalist).

Throughout this two digit structure, each "PSAT occupation" (all of them at the professional level and some of them unknown either to Census or the Dictionary of Occupational Titles as occupations e.g. Politician) are "embeded", so that by use of the simple conversion table their subsequent identification is feasible.

It should again be noted at this point that it was necessary to carry the study's classification system through the entire gamut of occupations, because of the inclusion of parental occupations. Also, in stating their choices on the questionnaire, the students were not constrained to choosing only the PSAT occupations, which aside from the entry, "other", restricted them to professional-level occupations. The first digit, therefore, of the five digit code was used (coupled with second digits denoting fields as above) to show level.

Thus, the two digits "1-0" would denote the field "Plants, Animals and Related Life Sciences" at the Technician level (e.g. Veterinarian Assistant). But Animal Caretakers and Gardners would be "6-7" with the digit "6" standing for the Census Category "Laborers, except farm", and the digit "7" (as opposed to "8") indicating that a "work setting" and a subject matter is involved that is related, however tenuously, to the above science field. On the other hand, the occupation Teacher Aid would be "1-8", indicating it to be at the semi-professional or technician level with no relationship to scientific, technical, or mathematical fields. And the occupation Warehouseman would be "6-8", showing it, like Animal Caretaker, to be in the Census Category of "Laborers, except farm," yet unrelated to a science field. Analogous reasoning in the clerical occupational group would dictate "4-7" as the appropriate first two digits for the detailed occupation Medical Secretary, but "4-8" would be used for the Legal Secretary as for other secretarial posts unrelated to a science field.

The last three digits of the five digits were used to number the detailed occupations sequentially once the general structure was established. Only in this way is it possible to identify the individual occupations when analysis calling for this degree of detail is required.

The Educational Classification System

The classification system devised for Education, namely for classifying Major Fields and indicating the Level of Educational Attainment, posed many of the same problems implicit in the area of occupations.

Again, a comprehensive structure was required, inasmuch as the students were asked to specify the educational level and fields of study of their parents. Further, the listing of PSAT choices of majors (all at the college level) to which they had earlier responded, had to remain identifiable for purposes both of subsequent analysis and as a criterion measure. Also, the students themselves were given a greater range of choice as to their anticipation level of attainment and field in the study's questionnaire than was the case with the PSAT listing.

The problem of level of educational attainment was resolved by constructing a simple two-digit series of codes that indicated level, extending from "0-0" for "Grade school or some high school," to "1-3" which denotes "More than four year college graduation," the latter used when such intervening codes as "1-0" or "1-1", denoting an MA or PhD, could not be employed for lack of information.

In the actual process of coding the questionnaires the necessity arose of introducing additional digits - "9-2" - to take care of situations where a foreign education was involved and the information provided was insufficient for purposes of constructing its United States equivalent. The two digits indicating level could be used alone to code the answers to questions involving level only, or they could be combined with the four digit code delineating a specific major (or subject field) to show both level and field.

The problem of devising a sufficiently comprehensive classification system that would encompass all "major fields" - using this term to include not only college majors but also various types of training and experience acquired largely on-the-job - was resolved, essentially, by deriving this element of the educational classification system (expressed in four digits) from the occupational classification system.

Again, the majors were grouped into five categories - (1) Science Majors - Plants, Animals and Related Life Sciences; (2) Science Majors - Human, Medical and Related Life Sciences; (3) Science Majors - Physical Sciences; (4) Engineering and Architecture Majors; and (5) Mathematics, Statistics and Computer Sciences Majors. The same first digits as had been used for occupations were again employed for the associated majors (e.g. "0" for Agricultural Engineer). Most of the college majors were represented in the PSAT listing for student choices. However, there were some (e.g. Entomology, Bacteriology, Speech Therapy, Child Development) which, although not covered in the PSAT listing, had to be provided for in processing the schedules, because of entries describing parents' education or students' choices of majors.

There was also the problem of distinguishing between educational "levels" not so much in the sense of duration or degree earned (although this is implied) as in the occupational level to which the education specified customarily leads. In this classification system, a second digit was not employed in order to indicate the precise level of schooling involved, as such a judgment would too often have meant going beyond the available data to unsubstantiated surmises. Rather, any education or training that was less than that represented by the Baccalaureate or above was also categorized with the same first digit given to professional training in the same field. Thus, the digit "0" which, in the first place, identified Agricultural Engineering, also serves to indicate other kinds of training in agricultural and horticultural occupations or in animal care occupations or in "environmental" occupations. Such other kinds of training might include that given at the technical or technological level - as in trade, business and proprietary schools; government, military, secondary schools and Junior College Vocational Education; or by way or apprenticeship and other on-the-job training.

A differentiation between educational levels can, therefore, be obtained in the four digit structure only by referring to the last three digits of the four digit code. These are sequential codes which serve to identify different specific majors and fields in the same way that the last three digits of the occupational codes identify detailed occupations. However, further insight as to the level of education involved (in the sense of duration or of the degree earned) can be obtained by linking these four digits to the two digits recording the parents' actual educational experience or to the students' anticipations respecting further education and training.

In coding educational majors and fields, the problem of distinguishing between science and non-science was no less critical than in categorizing occupations. In dealing with education, however, assigning three different digits in second place to express the non-science aspects of a field was not warranted because the element of "level" was handled in another manner. In the occupational classification the digit system "5" is used at the professional and semi-professional or technical levels to indicate at most a partial relationship to science, technology and mathematics; while the digit "7" in second place expresses the same relationship for other occupational groups. The digit "8" is used throughout the occupational spectrum to connote that the occupation is regarded as "Non-Scientific, Technical, Mathematical." For educational majors or fields only two digits (in this case, first digits) were used to serve the same purpose, and the choice of digit was linked to the occupation for which the major commonly serves as preparation.

The digit "5" in first place identifies education and training (whether at the college level or below) that has a "scientific, technical or mathematical aspect." The sequential three last digits serve to clarify which field is generating these "aspects" (e.g. Plants, Animals and Related Life Sciences or Mathematics, Statistics and Computer Science). The digit "8" is used throughout the total structure, as in the occupational, to identify those college majors and other types of education and training which are not related to scientific, technical or mathematical fields, or that have no "aspects" of these fields.

Many criticisms could be leveled at both the occupational and the educational classification systems devised for purposes of classifying and analyzing the data gathered in this study. Chief among these might be challenges directed at the categorization of some occupations (and their associated college majors or other education and training) as science or non-science, or as possessing or not possessing aspects of the technical or mathematical. Far more empirical data are needed than exist today to enable the investigator to maintain with real confidence that e.g. metal-working occupations are more nearly related to science technology and mathematics than are wood-working occupations; or that it is valid to distinguish between disciplines that deal with humans and those that deal with rocks.

For purposes of this study, however, it was necessary to construct certain variables in terms of which some of the data would be classified before the soundness of the variables themselves could be tested or otherwise substantiated by empirical evidence. To a degree, at least, their soundness can be measured in the statistical manipulation of this study's occupational and educational data. If the categories that have been used prove to be sound and meaningful discriminators (or if the changes required to make them so become apparent) the classification systems used in this study may provide a take-off point for others engaged in similar investigations.

VIII. CRITERION OF SCIENCE-BOUNDNESS

The study is based upon comparison of science-bound young women with non-science-bound. Vital, therefore, is a sound criterion of science-boundness. Since it is wholly appropriate, if not indeed desirable, that students at the beginning of their high school senior year should not be fixed on a future educational and vocational choice, the task of determining science-boundness is a very difficult one. At this developmental point anything can change. With this college going population the exploratory experiences of their early college years can and should exert considerable influence upon ultimate directions.

The instability of vocational choice at this point is well documented. Rever (34) says "expressions of career choice during high school years tend to be highly unstable (Astin 1967, 1968, Flanagan 1966, Walley 1968)...the stability rate (over four years)...is even lower for those choosing science... One of the reasons for the lower stability rates for the sciences is the tendency for an out-migration pattern (Astin 1967) throughout both high school and college." McLaughlin and Tiedman (24) found even greater change when the interval was increased, specifically in the five years after the first year of college. Astin and Myint, 1971 (7), found that post high school experiences were the best determinants of young women's career out-comes. The instability in career choice between the high school senior year and five years later was close to fifty percent. These young women changed their career plans. In another study by Rezler, 1967 (35), of high school students, she found that by the end of the junior year in high school it is possible to determine which young women will enter technical and scientific vocations, whom she called pioneers, and those who will enter traditionally feminine occupations such as nursing and teaching. However, both the traditionalists and pioneers have strong tendencies to change vocational plans during college.

Clearly, then, too much reliance cannot be placed on the young woman's declaration of career choice or even educational majors at the beginning of her senior year, and this study gave every evidence of supporting this instability. Nevertheless, the best gauge possible needed to be established to separate probable science-boundness from probable non-science-boundness.

For purposes of this study, science was defined as biological and physical sciences, not social sciences. It was recognized that science, mathematics and technology were very large areas to cover, and some limits needed to be drawn. Even within this attempt to restrict the science definition, some disciplines and professions were difficult to classify, e.g. physical education, human development and oceanography. Where the project personnel were not certain, authorities were consulted either in writing or in person. The basic element considered in establishing the classifications was content of training for the field. Final disposition is apparent in the Occupational Classification System, Appendix C.

Another difficulty in developing clean criterion groups arises in the attempt to delineate biological and physical sciences from social sciences. The analytical and mathematical aptitude which predicates science-related choices may also be fully or partly employed in other disciplines, e.g. economics, anthropology, linguistics. It is in many ways remarkable, as previously indicated, that only seventy-five, or fifteen percent, of the entire group of young women at this stage gave no consideration to any of the science related fields.

All of the study's student data were carefully and thoroughly examined for possible use as a criterion. It appeared that no single item alone might be as effective a discriminator as composite. Additionally, in view of the instability of occupational choice at this level, it seemed that the more close at hand a projected action or decision, the better its chance was of being a realistic gauge of science-boundness. Accordingly, considerable weight was given to the intentions actually to take more science and math courses. The next most immediate plan, experientially, was college major, and then future occupational choice. It was from these items that a composite was evolved.

With a large number of trials and revisions, the following fairly rigorous procedure was established to produce four groups into one of which each student was placed:

1. Science-bound
2. Science/Mathematics-bound
3. Mathematics-bound
4. Other-bound

Some of those grouped under 4 might only be undecided, with potentiality for 1, 2 or 3.

METHODOLOGY FOR DETERMINING CLASSIFICATION

Below are the rules for classifying subjects, giving the items and responses used.

Classification 1, Science Bound

Page 22, Number 4 of F Questionnaire (and Page 7, Number 2 of M Questionnaire) has checked "5", and Page 9, Number 3 of F Questionnaire (and Page 5, Number 1 of M Questionnaire) has entered:

-Decided on scientific or technical major, or

-Undecided and first two choices are scientific or technical majors and Page 10, Number 1 of F Questionnaire (and Page 5, Number 2 of M Questionnaire).

-Decided on scientific or technical career, or

-Undecided and first two choices are scientific or technical careers.

Readmission Procedure

Page 22, Number 4 of F Questionnaire (and Page 7, Number 2 of M Questionnaire) has checked "4" and Page 9, Number 3 of F Questionnaire (and Page 5, Number 1 of M Questionnaire) has entered:

-Decided on scientific or technical major, or

-Undecided and no non-science/non-technical majors and Page 10, Number 1 of F Questionnaire and Page 5, Number 1 of M Questionnaire.

-Decided on scientific or technical career, or

-Undecided and no non-science/non-technical careers.

CLASSIFICATION 2

As above to determine status of "science-bound", except no readmission procedure for mathematics-bound.

Page 19, Number 1 of F Questionnaire and Page 7, Number 2 of M questionnaire has checked "5" and Page 9, Number 3 of F Questionnaire and Page 5, Number 1 of M Questionnaire:

-Decided on mathematics or related major or science or technical major

-Undecided and first two choices are as above and Page 10, Number 1 of F Questionnaire and Page 7, Number 1 of M Questionnaire.

-Decided on mathematics or related career or science or technical career

-Undecided and first two choices are as above.

No Readmission Procedure

CLASSIFICATION 3

Page 19, Number 1 of F Questionnaire and Page 7, Number 1 of M Questionnaire has checked "5" and Page 9, Number 3 of F Questionnaire and Page 5, Number 1 of M Questionnaire:

-Decided on mathematics or related major or science or technical major

-Undecided and first two choices are as above and Page 10, Number 1 of F Questionnaire and Page 5, Number 1 of M Questionnaire.

-Decided on mathematics or related career or science or technical career

-Undecided and first two choices are as above.

Readmission Procedure

Page 19, Number 1 of F Questionnaire and Page 7, Number 1 of M Questionnaire has checked "4" and Page 9, Number 3 and Page 5, Number 1 of M Questionnaire:

-Decided on mathematics or related science or technical or major or

-Undecided and no major not in above group and Page 10, Number 1 and Page 5, Number 1 of M Questionnaire.

-Decided on mathematics or related career or science or technical career or

-Undecided and no career choice not in above group.

CLASSIFICATION 4

All exclusions from above procedures.

Later, in interviewing some selected young women who appeared firmest in their orientations as determined by this classification system, it became evident that they were wavering or actually contemplated change (see interviews). As a result, this criterion was reexamined.

Other possibilities were tested, but with the recognition that there might be no fully sound or stable criterion available at this point. Nevertheless, for purposes of this study,an operating criterion was required.

On the assumption that any indication of a major or objective relating in any way or at any level to science, mathematics or technology represented a conscious consideration of this direction, one possibility which was examined was the contrast between young women who made no mention of a major or occupational choice within this sphere vs. those who made any mention in either aspect, even as a third possible choice in either major of occupational goal. As has been indicated, however, not a sufficient number of the 500 young women selected for this study gave no mention whatsoever of any science, math, or technology.

On the hypothesis that immediately contemplated specific action might be the best predictor, examination was made of each young woman's present intention to continue instruction in mathematics and in science. No significant differences were found which permitted the establishment of these intentions as a criterion.

Preliminary study shows a Pearson Correlation Coefficient of .49 between the Q and V scores for the final group of young women, suggesting both some relationship and some independence between these two scales. The mean for young women on the 0 score was 55.6, SD = 6.8, and V score was 49.9, SD = 9.7. (The Verbal minus Quantitative score values ranged from -18 to +32.)

When it was found that,for the composite criterion, math scores were higher for classifications 1, 2 and 3 combined than for 4, significant at the .02 level, it seemed reasonable to utilize this criterion which separated 184 young women in classifications 1, 2 and 3 from 316 in 4. For the any science consideration vs. none, there was absolutely no difference in the PSAT Quantitative scores between the two groups.

Further, there is a very high relationship between intention to continue in mathematics and the PSAT math score, significant beyond the .001 level. The higher the score and greater the distance from the V score, the more apt the young woman was to say that she intended to continue in math. This item was, of course, a significant determinant of the composite.

It was also found that with the composite criterion, the science-technology-math PSAT Quantitative mean was higher than the Verbal, and that the non-science PSAT Verbal mean was higher than the Quantitative. This reverse relationship was significant at the .01 level.

IX. OVERALL CHARACTERISTICS OF YOUNG WOMEN

For an overview of the entire 500 young women, their responses on the Student Questionnaire will be presented by frequency and percent, including all usable responses. Attention is called to this policy, in that totals will vary for different items. All data subsequently presented will emphasize primarily differences noted in comparisons between groups. The data in this section, along with the F Questionnaire in the Appendix constitute a general reference.

Data here are presented under the following headings:

1. Demographic
2. Educational and extra-curricular experiences
3. Preferences
4. Plans:
    - a. Educational
    - b. Career
    - c. Marital
5. Evaluation of Experience

Two items derive from the PSAT testing at the end of the Junior Year and serve to describe the group.

The first of these is the PSAT scores:

	Raw Scores		Norms for Senior Girls	
Scale	M	SD	Total	College Going
V-Verbal	49.9	9.7	81	61
M-Math	55.6	6.8	90	81

When it is recalled that it is a very select group of college going students who take the PSAT it is clear that this is indeed an unusually able group of young women.

Their grade averages at the beginning of their Junior Year as reported on the PSAT questionnaire are as follows:

	N	Percent
A	76	15.3
A- B+	227	45.8
B	155	31.3
B- C+	36	7.3
C	2	.4

1. DEMOGRAPHIC CHARACTERISTICS

At the time the young women filled out the questionnaire early in their Senior Year, their ages computed from their birthdates were:

Age	N	Percent
16	86	17.9
17	388	80.7
18	6	1.2
over 19	1	.2

The ethnic composition of the group: ("Ethnic background as you identify yourself:")

	N	Percent
American Indian - Native American	3	.6
Black	8	1.6
Caucasian	380	79.0
Chicana or Latina	6	1.3
Chinese	71	12.4
Filipina	3	.3
Japanese	23	4.1
Polynesian	5	.6

Inspection indicates the under and overrepresentation of ethnic groups in relation to the composition of the total population due, at least in part, to selection of schools and their socio-economic and cultural community bases, as well as their own enrollment policies.

Parents' education and occupational status is given below and was clearly above the average. No base rate census figures are available for this parents' age group for direct comparison, but these figures speak for themselves. One particularly interesting finding was that in a high unemployment area - eight to nine or more percent at the time of data collection and with heavy scientist layoffs - only one father was reported unemployed, and no mothers. One additional father was institutionalized, and so out of the labor market.

Highest level of Education reached by Parents:

Level	Father N	Father Percent	Mother N	Mother Percent
Grade school or some high school	26	5.2	26	5.2
High school graduation	48	9.6	77	15.4
Vocational training (as trade or business school)	12	2.4	36	7.2
Some four year college or some junior college	52	10.4	70	14.0
Junior or community college graduation	19	3.8	23	4.6
Four year college graduation	107	21.4	109	21.8
Some graduate or professional school	29	5.8	40	8.0
Higher graduate degree				
Masters (as MS, MA)	63	12.6	63	12.6
Doctorate	33	6.6	6	1.2
Professional (as medicine, law)	61	12.2	6	1.2

The mothers keep pace relatively well, proportionally, in college graduation and masters degrees. Fathers have many more advanced graduate degrees, and fewer have less than college graduation. It is interesting that fewer of the young women were unfamiliar with mother's than father's education.

Foreign education, largely accounted for by the Asian subsample:

	Father N	Father Percent	Mother N	Mother Percent
None	434	87.1	433	87.1
Some	18	3.6	8	1.6
All	46	9.2	56	11.3

Also looked at was the consistency between undergraduate major and major at any higher level of attainment in relation to science-technology-math. Of those to whom this indicator applied (college graduation and above) one father and one mother changed from science to nonscience, and four fathers and one mother moved towards science.

	Father's Occ.		Mother's Occ.	
Professional	N	Percent	N	Percent
Sci.-Plants, Animals re. Life Sci.	12	.2	1	.2
Sci. - Human	41	8.2	35	7.0
Sci. - Phys. Sci.	8	1.6	3	.6
Engineer & Architecture	74	14.8	1	.2
Math. Statistics & Comp. Sci.	3	.6	6	.2
Setting or Activity	18	3.6	46	9.2
Prof. Non Sci.	59	11.8	75	15.0
Totals:				
Prof. Sci.	156	31.2	46	9.2
Prof. Non Sci.	59	11.8	75	15.0
Profess.	215	43.0	121	24.2
Semi-Professional				
Technician-Human, Med.& Rel.Life Sci.	4	.8	10	2.0
Technician-Physical Sci.	1	.2		
Technician-Engin. & Arch.	11	2.2		
Technician-Math Stat. & Comp. Sci.	11	2.2	2	.4
Technician-Sci-Tech-Math Set. or Act.	5	1.0	2	.4
Non-Sci. Technical-Math	1	.2	7	1.2
Totals:				
Semi-Prof. Sci.	32	6.4	14	2.8
Semi-Prof. Non Sci.	1	.2	7	1.4
Semi-Professional	33	6.6	21	4.2

	Father's Occ.		Mother's Occ.	
Managers & Administrators	N	Percent	N	Percent
Scien.-Tech.-Math.	32	6.4	3	.6
Non-Scien.-Tech.-Math.	84	16.8	23	4.6
	116	23.2	26	5.2
Sales				
Scien.-Tech.-Math.	4	.8	1	.2
Non-Scien.-Tech.-Math.	28	5.6	25	5.0
	32	6.4	26	5.2
Clerical and Kindred Workers				
Scien.-Tech.	3	.6	12	2.4
Non-Scien.-Tech.	11	2.2	73	14.0
	14	2.8	85	17.0
Craftsmen, Foremen & Kindred				
Scien.-Tech.-Math.	20	4.0	3	.6
Non-Scien.-Tech.-Math.	12	2.4	2	.4
	32	6.4	5	1.0
Operatives & Laborers				
Scien.-Tech.-Math	4	.8	12	2.4
Non-Scien.-Tech.-Math.	17	3.4	73	14.6
	21	4.2	85	17.0
Service Workers				
Scien.-Tech.-Math.	3	.6	4	.8
Non-Scien.-Tech.-Math.	27	5.4	16	3.2
	30	6.0	20	4.0
Housewife			175	35.0

The young women appear to be more certain of their parents' occupation than of their education, and on the whole described them well.

The selectivity of this sample is readily perceived in occupational level. Forty-three percent of the fathers are classified as professionals compared with an average of twenty percent in the six Bay Area Counties from which the sample was drawn. Using the yardstick of science-technology-mathematics as described in the classification development procedures (as primary function, or as related activity setting), 244 fathers, or fifty percent could be said to fall in this group, and ninety-three of the mothers, nineteen percent. This is a surprisingly high figure for the fathers who must have generally provided some such orientation for the young women. Perhaps this also must help to account for the relatively few young women who mention no aspects whatever of these areas among any of their present contemplated objectives. Another notable fact is that just a little over a third of the mothers are currently not employed, and are housewives, or "household engineers", "home administrators", etc., as the young women put it.

The number of stepfathers and stepmothers reported was so small as to be inconsequential and therefore they were not tabulated.

The size of the young women's household is represented by the numbers of family members currently residing there, beside themselves.

	N	Percent
1	20	4.0
2	75	15.1
3	143	28.8
4	135	27.2
5	79	15.9
6	25	5.0
7	11	2.2
8 or more	6	1.2

The median is four. On the whole, these young women are part of fairly large family groups, only nineteen percent being alone with one or both parents at this time.

The composition of the current household:

Natural Family:	N	Percent
Only Child, both parents present	53	10.6
Only child with mother	14	2.8
Child with mother and siblings	36	7.2
Only child with father	5	1.0
Child with father and siblings	6	1.2
Both parents present and siblings	321	64.3
Both parents present and siblings plus others	3	.6
Other natural family composition	37	7.4
	475	95.1
Broken Family:		
Only child, own mother, step-father	4	.8
Child, own mother, step-father and siblings	10	2.0
Child, own father, step-mother and siblings	8	1.6
Other broken family	2	.4
	24	4.8

377, or eighty-five percent, are living with both parents either with or without other siblings, signifying a large preponderance of original normal family units.

Birth Order	N	Percent
Only Child	29	5.8
First	188	37.6
Second	148	29.6
Third	87	17.4
Fourth	27	5.4
Fifth	10	2.0
Sixth or younger	8	1.9
Twin	3	.6

Almost half of this group, counting only children, are first born, almost three quarters first or second born.

Siblings distribute as follows:

	Brothers		Sisters	
	N	Percent	N	Percent
1	202	57.5	198	59.8
2	107	30.5	101	30.5
3	32	9.1	24	7.3
4	6	1.7	8	2.4
5	1	.3		
6	2	.6		
8	1	.3		

2. EDUCATION AND ACTIVITIES

Semester courses taken, grades seven to eleven:

No. Courses	Science N	Science Percent	Math N	Math Percent
1	4	.8	1	.2
2	38	7.6	4	.8
3	98	19.6	17	3.4
4	143	28.6	60	12.0
5	56	11.2	128	25.6
6	67	13.4	55	11.0
7	17	3.4	46	9.2
8 or more	69	13.8	186	37.2

Course Program Senior Year Projected to Second Semester:

	N	Percent
No science, no mathematics courses	78	5.6
One science course (no math)	62	12.4
Two or more science courses (no math)	151	30.2
One mathematics course (no science)	10	2.0
Two mathematics courses (no science)	22	4.4
One science, one mathematics	21	4.2
Two or more science, one mathematics	39	7.8
Two science, two mathematics, or more	110	22.0
Other	7	1.4

As seen in interviews, plans changed prior to the second semester, and these tentative intentions may not have been fulfilled.

AVERAGE GRADES - 9TH THROUGH 11TH YEAR

	English		Math		Social Studies		Science	
	N	Percent	N	Percent	N	Percent	N	Percent
A	240	48.2	117	23.5	286	57.3	171	34.7
A-	60	12.0	56	11.2	52	10.4	58	11.8
B+	72	14.5	57	11.4	42	8.4	53	10.8
B	116	23.3	174	34.9	95	19.0	156	31.6
B-	5	1.0	35	7.0	9	1.8	18	3.7
C+	1	.2	14	2.8	5	1.0	9	1.8
C	4	.8	45	9.0	10	2.0	26	5.3
C-							1	.2

These grade averages cannot be compared directly with the PSAT earlier averages because of the difference in the framing of the questions. In the questionnaire the question was open ended. Numerical responses were converted to letters.

Overall, social studies were easiest for these young women, or they performed better in them. English was next and Math, as they themselves report, most difficult as reflected in grades achieved.

Grade Point Average for 9th through 11th year, excluding Physical Education:

	N	Percent		N	Percent
A	144	29.0	B-C+	25	5.0
A-B+	211	42.5	C	2	.4
B	114	23.0			

The question was asked in this fashion because it is customary to compute grades in this way for admission to California public colleges and universities. It was known that at this point these students would have this calculation well in mind. A "B" average is requisite for regular admission to the University of California system and only five percent of this entire group would be able to enter immediately if they so wished. Even this ineligible group would have an alternate route available for admission to the University System through scores on their College Entrance Examination Board tests, given their ability level.

PARTICIPATION IN OUTSIDE ACTIVITIES

"Please list any activities you have engaged in outside of school hours, e.g. photography, music, camping, hospital volunteer."

Number of Total Activities	Percent of Participants	Number of Science Related Activities	Percent of Participants
0	1.2	0	35.6
1	6.2	1	31.9
2	11.9	2	22.0
3	16.0	3	8.4
4	20.2	4	1.4
5	12.6	5	.2
6	31.9	6	.4

As would be hypothesized, these able, achieving young women are very active, being involved in many matters of interest outside of school and home.

PARTICIPATION IN ORGANIZATIONS

"List any clubs, groups, or organizations you have belonged to, e.g. science club, church group, Girl Scouts."

Number of Total Organizations	Percent of Participants	Number of Science Related Organizations	Percent of Participants
0	1.0	0	69.6
1	11.7	1	24.6
2	18.1	2	4.2
3	20.4	3	1.2
4	15.4	4	.4
5	12.3	5	
6	21.0	6	

PAID WORK EXPERIENCE

"Describe any paid work experiences you have had to date including after school, weekend, vacation and summer employment, e.g. sales clerk in variety store, babysitting, file clerk in an architect's office, fruit picking."

Number of Experiences	Percent of Participants	Number of Science Related Experiences	Percent of Participants
0	2.3	0	66.5
1	16.9	1	25.8
2	27.7	2	6.8
3	27.1	3	.8
4	16.1	4	
5	6.2	5	
6	3.7	6	

3. PREFERENCES

Keeping in mind the literature on personality traits of science-inclined individuals, the effort was made to tap such traits, interests and values.

The questionnaire asked: "Please indicate the degree to which you like to:"

Preferences	Percent of Responses				
	Not At All	Very Little	Somewhat	Much	Very Much
Solve puzzles or problems	.6	6.2	45.6	32.0	15.6
Do things independently of others	0	2.4	30.3	38.7	29.1
Do well and accomplish	0	0	3.0	18.2	78.8
Have control over what you work on	0	.8	8.0	30.1	61.0
Put material in written form	.4	12.7	41.6	28.4	16.9
Analyze an idea or issue	1.4	9.5	36.6	28.8	23.7
Help people	0	.6	12.2	12.2	53.7
Take things apart to see how they work	5.2	31.7	30.3	20.0	12.8
Spend time with your family	1.4	6.2	30.5	36.9	25.1
Study foreign languages	6.8	15.1	32.9	21.5	23.7
Plan and organize what you do	.4	3.0	22.6	35.5	38.5
Be a leader	.8	10.2	38.8	27.5	22.7
Receive recognition for what you do	.4	3.6	27.7	31.1	37.3
Have others articulate issues or policies for you	15.8	39.2	35.5	8.0	2.1
Have many friends	.8	3.0	14.7	29.1	52.4
Do things that will improve society	0	2.0	30.7	33.9	33.3
Draw, paint, or play an instrument	2.0	12.4	18.8	16.2	50.5

Very few items appear to discriminate strongly. The most preferred items of this group (Very Much and Much) are: doing things independently of others, doing well and accomplishing, having control over what you work on, planning and organizing what you do, helping people, and having many friends - an interesting combination of strength and independence as well as interdependence upon people.

4. PLANS

The highest level of education desired to obtain in the lifetime:

	Percent
Vocational training (as trade or business school)	.4
Some college education	1.2
Junior or community college graduation	1.0
Four year college graduation	18.3
Some graduate or professional school	10.4
High graduate degree	
Master (as MS, MA)	26.1
Doctorate (as Ph.D., D.Sc.)	13.1
Professional (as medicine or law)	22.5

Very few indeed do not hope at least to complete a college degree. It is interesting that the aspiration level for the young women, if achieved, will approximately resemble the father's educational level, and far outstrip their mothers.

For selected degree levels rough comparisons of this group can be made with 1973-74 college-bound senior females, as reported by College Entrance Examination Board in terms of percents.

	National N = 421,236	California N = 46,335	Exper. Group N = 500
Assoc. of Art Degree	3	2	1
B.A. or B.S. Degree	32	32	29
M.A. or M.S. Degree	20	23	26
M.D., Ph.D., or other Prof. Degree	13	17	36
Undecided	27	23	7

This comparison affords some indication of the degree of selectivity of this study's group in achievement orientation as well as capacity.

The type of college expected to be the first attended (by percent):

Junior or Community College	17.5
State college	9.6
Private college, liberal arts	5.2
Private college, other	2.8
Women's college	.8
State university	53.2
Private university	9.8
Other type of college	.6
None	.4

Of this group, sixty-three percent are planning to attend a university. Only four young women are bound for a non-coeducational institution. Nineteen percent are optimg for private higher education.

Parents' aims for their daughters can be related to the daughters' aims. The young women were asked, "Would your father (mother) like you to aim for a particular level of education? ...If "Yes" please check level."

	Father Percent	Mother Percent
Yes	79.6	80.4
No	19.0	17.2

Level of Education (by percent):	Father	Mother
Vocational training (as trade or business school)	.2	.2
Some college education	3.4	4.2
Junior or community college graduation	.6	.8
Four year college graduation	38.2	40.6
Some graduate or professional school	7.6	7.3
Higher graduate degree		
Masters (as MS, MA)	10.7	11.9
Doctorate (as Ph.D, D.Sc)	4.6	4.2
Professional (as medicine or law)	13.3	11.5

Parents are very much involved in their daughters' education and have aspirations for them to go beyond the level reached by them. Fathers and mothers are pretty much in agreement, but it is notable that the young women's aspirations for themselves are much higher even than their parents' aspirations for them.

The table below gives the young women's choices of college major as indicated at the beginning of their junior year on the PSAT Questionnaire and a year later on the Student Questionnaire of the present study. The majors have been classified according to procedures explained above (Chapter VI and Appendix B, 1). The senior data are separated as to whether the choices were definite, or undecided and tentative.

CATEGORIZED COLLEGE MAJOR CHOICES DURING JUNIOR AND SENIOR YEARS (IN PERCENT)

Categories of Intended College Majors	Junior Year	Senior Year		
		Definite	Tentative	Total
Science - Plants, Animals and Related Life Sciences	8.4	7.0	2.4	9.4
Science - Human, Medical and Related Life Sciences	17.0	12.4	9.0	21.4
Science - Physical Sciences	4.2	2.0	2.0	4.0
Engineering and Architecture	2.0	2.0		2.0
Math, Statistics and Computer Sciences	3.8	1.4	2.0	3.4
Science-Technology-Mathematics Aspects	4.2	3.6	2.6	6.2
Non Science-Technology-Math	24.2	14.8	11.0	25.8
Service Occupations		.4		
Undecided	33.4	55.2		

Some of what may appear to be differences could be accounted for on the basis of the difference in methods used in collection of the data. PSAT presents a check list, and the questionnaire offered open ended choice and therefore more choices were indicated.

Some very contemporary labor market information must have been absorbed between the junior and senior year indicated by an increase in interest in Business Administration, and the general disinterest in teaching, details not directly visible because of the aggregating of individual majors. Particularly interesting is the increase in Undecideds which can well be interpreted as development of broader horizons, and thus maturity.

By regrouping, some approximate comparison can be made between these young women's senior choices and CEEB base rate data on selected intended fields of study. These comparisons are presented below, in percentages.

INTENDED FIELDS OF COLLEGE STUDY FOR FEMALES (IN PERCENT)

	National (N = 421,236)	California (N = 46,710)	Study Group (N = 500)
Agriculture	1	2	0
Architecture	1	1	1
Art	5	5	1
Biological Science	10	14	15
Business	8	8	5
Computer Science	1	1	1
Education	13	10	2
Engineering	0	0	1
English	5	6	2
Foreign Language	3	3	5
History and Culture	1	1	2
Home Economics	3	3	3
Journalism	2	2	1
Math	3	2	3
Music	3	3	5
Nursing and Health	18	14	7
Physical Sciences	2	2	4
Psychology	4	5	5
Social Sciences	9	10	2
Undecided	8	8	55

B. CAREER PLANS

The question was posed:

1. If you have made a definite or tentative decision about your intended career, please indicate this career on the line below. If you have not arrived at a career decision, enter "undecided" on the line below.

Intended career:____________________

2. If you have written undecided on the line above, please list three careers you have thought about in the order they appeal to you.

a.____________________

b.____________________

c.____________________

CATEGORIZED CAREER PLANS DURING JUNIOR AND SENIOR YEARS (IN PERCENT)

Categories of Intended Career Plans	Junior Year	Senior Year		
		Definite	Tentative	Total
Scientist - Plants, Animals and Related Life Sciences	6.6	3.8	2.4	6.2
Scientist and Practitioner - Human, Medical and Related Life Sciences	16.0	14.4	8.8	23.2
Scientist - Physical Sciences	2.4	.4		.4
Engineer or Architect	2.0	1.6		1.6
Math, Statistics and Computer Sciences	.8	.4		.4
Science-Technology-Mathematics Setting or Activity	1.8	1.2	1.0	2.2
Non Science-Technology-Math	23.2	14.4	15.6	30.0
Technician - Human, Medical and Related Life Sciences	2.4	3.6		3.6
Managers and Administrators - Science-Technology-Math	.2	1.2		1.2

CATEGORIZED CAREER PLANS DURING JUNIOR AND SENIOR YEARS (IN PERCENT) (cont.)

Categories of Intended Career Plans	Junior Year	Senior Year Definite	Senior Year Tentative	Total
Sales		.2		.2
Clerical		.4		.4
Farmers		.2		.2
Protective Service Workers		.2		.2
Undecided	39.2	58.2		58.2
	N=472	N=501	N=141	

Some changes are of interest. The Humanities and Social Sciences as choices decreased and the business area increased over the year. This is in keeping with other findings of Oliver, 1975 (27),"In considering stereotypes, it should be kept in mind that the demographic changes relating to marriage and childbearing, the effects of affirmative action programs and the forward impact of the feminist movement may all be influential in altering sex roles in American Society. Although a change in sex roles may be taking place, Broverman and others 1972, have concluded, on the basis of their research and that of others, that well-defined sex-role stereotypes still exist. There is some evidence, however, that changes have occurred. Wilson 1971, reported that female college students are perceiving women's roles as less traditional and more liberal with regard to occupational equality. Astin and Bisconti 1973, who compared women college graduation of 1965 and 1970, reported data suggesting that college women were less inclined to shift into teaching and more apt to transfer into business." As in college majors, the number of those indicating uncertainty increased drastically, although some of this difference may be attributed to the difference in the format of this item.

The search for comparative data led to excerpting from the American Council of Education Annual Freshmen Survey the probable career occupations designated by women on entrance to college, roughly a year later than those for this group. Science and technological occupations were selected.

ACE FRESHMEN SURVEY FOR WOMEN, CAREER PLANS (IN PERCENT)

Probable Occupations	1966	1967	1968	1969	1974	Study Group Definite or Tentative 1st Choice (1974)
Engineer	0.2	0.2	0.2	0.3	0.8	2.4
Farmer/Forester	0.2	0.1	0.1	0.2	1.3	1.8
Nurse	5.3	5.4	6.1	6.0	10.2	2.8
MD, DDs.	1.7	1.5	1.3	1.3	3.5	12.2
Health Prof.	6.6	6.3	5.7	6.0	12.5	7.0

This group exceeds even the 1974 growth point for these scientific-technological occupations, especially in the case of medicine.

A separate analysis, discussed in some detail later, was made separating those young women who mentioned at any point an intended or considered career involving any science-technology-math whatsoever from those who did not mention a career with this element in it. Out of the 500 young women, 425 contemplated this science-technology-math area at one or another point, only seventy-five did not.

The young women were asked: "Would your parents like you to aim for a particular job or career, and if so, which?"

	Father		Mother	
	N	Percent	N	Percent
Yes	108	21.8	126	25.4
No	312	62.9	299	60.3

If Yes, which?

Career Rich in Sci.-Math Content	Father N	Mother N	Career With Little Sci.-Math Content	Father N	Mother N
Landscape Architect	1	0	Sociologist	0	1
Veterinarian	2	3	Linguist	2	1
Scientist - Plants, Animals	8	7	Musician	1	3
Dietician/Home Economist	0	2	Other Actor, Writer Entertainer	1	3
			Advertiser	1	0

Career Rich in Sci.-Math Content	Father N	Mother N	Career With Little Sci.-Math Content	Father N	Mother N
Dentist	1	0	Lawyer	7	5
Pharmacist	2	2	Recreation Worker	1	0
Physician	31	27	Social Worker	0	1
Psychologist	0	1	Other Professional	1	0
Nurse	6	9	Secondary Teacher	1	3
Occupational Therapist	1	1	Teacher, unspecified	1	9
Physical Therapist	1	1	Business Management	1	6
Scientist	4	3	Sales	2	1
Architect	1	2	Secretary	1	6
Aeronautical Engineer	1	1	Craftsman	1	0
Civil Engineer	1	1	Airline Stewardess	1	0
Engineer	2	1	Military	1	0
Computer Scientist	1	0	Policewoman	0	1
Accountant	6	7	Journalist, Writer	3	5
Dental Hygienist	1	2	Athlete	1	1
Medical Technologist	0	3	Artist	1	0
			Dancer	1	3

Parents are far less prone to attempt to influence vocational futures than the level of education. Of those who are reported by the young women as attempting to influence vocational choice, some desires of parents are mentioned which are not proposed by the young women themselves: athlete, recreation worker, airline stewardess, military. It is particularly fascinating finding that the mothers are more prone than the fathers to hope that their daughters will go into traditional stereotypic female occupations.

Deflected perhaps from contemplation of the housewife role by changing societal attitudes and their own interests and abilities, it seemed possible that these young women might consciously or unconsciously satisfy their need by incorporating relationship with children into their work. Accordingly, a separate analysis was made of the number of young women who mentioned work specifically involving children as either a definite or tentative first choice. This turned out to be 131, or twenty-seven percent of the sample.

C. MARITAL PLANS

There are no recent studies of young women's perception of their sex roles which are directly comparable to the data in this study, either in age level, geographical location, or for such a specialized group. However, there are some soundings which are relevant, since Margaret Mead stated before 1967 that there has been a profound and growing desire in our country for women to contribute not only as mothers but also as individuals. A study by Rappaport et al (33) in 1970 indicated that single college women were preserving the traditional female stereotypes, whereas the married students were accepting the value of self-achievement. Epstein et al (16) in a 1972 publication found that of their 1970 sample, only twenty-eight percent saw themselves as housewives with one or more children compared with their 1965 national sample in which thirty-five percent had chosen housewife with one or more children. Voss and Skinner (43) in 1975 report that perceptions of the social sex-roles of women are still changing. Their study replicates Rappaports research with college women in 1973 with the hypothesis that both single and married college women would have a greater extra-familial orientation than did the 1969 sample. Their hypothesis was confirmed and they concluded that "women today seem to feel more comfortable about expressing self-achieving orientation then did women in past years; it is more socially acceptable and desirable...It appears from these data that changes are taking place in attitudes toward women's stereotyped roles in this society." From our present study's lone mention of housewife, one wonders if at least in this culture the pendulum has not had a full swing so that it may not be acceptable to express a non-career orientation at all!

The young women in this group have this to say about their present ideas on this subject:

"If marriage is included among your plans, please indicate below when you would like to be married."

	N	Percent
Before you complete your education	19	4.0
Immediately after you have completed your education	27	5.7
After you have completed your education and been employed for a while	216	45.0
Anytime after education finished	14	3.0
Whenever time is right	62	13.1
After A.B.	5	1.1
Don't Know	123	25.9

"If you plan to work, please indicate below the length of time you would most like to be employed during your lifetime."

	N	Percent
For a brief period before marriage	4	.8
For brief intervals throughout your life	25	5.0
Part-time for the major part of your life:		
If not married	4	.8
Together with being married - without children	21	4.2
Together with being married - with children	84	16.9
Full-time for the major part of your life:		
If not married	12	2.4
Together with being married - without children	57	11.5
Together with being married - with children	117	23.5
Don't know	66	13.3
Full-time whether married	16	3.2
Full-time if not married okay if married	6	1.2
Part time with family responsibility full-time otherwise	38	7.6
According to need	6	1.2

Fifty-four percent intend to work full-time, usually regardless of family responsibilities, an additional twenty-two percent plan parttime work, regardless of circumstances ; seventy-nine percent in all now intend to continue work participation on some kind of regular basis.

5. EVALUATION OF EXPERIENCE

Whereas previous sections were designed to obtain facts or present attitudes, the following questions were directed toward the subjects review and appraisal of their experiences.

REACTION TO PSAT SCORES

	Math		Verbal	
	N	Percent	N	Percent
Higher than expected	82	16.8	70	14.3
About as expected	246	50.3	256	52.4
Lower than expected	161	32.9	163	33.3

ESTIMATE OF ABILITIES

	Math		Verbal	
	N	Percent	N	Percent
Very Superior	22	4.4	37	7.5
Superior	268	54.1	188	38.1
Average	199	40.2	235	47.7
Below	6	1.2	33	6.7

In general the young women's self-estimates are insufficiently high but they seem to recognize their quantitative capacities a bit better, probably because of lesser expectations generally for females' aptitude and achievement in mathematical areas.

REACTION TO HIGH SCHOOL GRADES

	Self		Father		Mother	
	N	Percent	N	Percent	N	Percent
Well Satisfied	121	24.2	205	42.2	217	43.9
Satisfied	237	47.4	223	45.9	221	44.7
Not Satisfied	140	28.0	81	10.5	52	10.5

As can be seen, the young women are much harder on themselves than the parents are on them. Those 140 young women who expressed dissatisfaction gave these reasons:

	N	Percent
Own problems; started work sliding	19	13.4
Not enough career planning goals	4	2.8
Competition reduced grades	27	19.0
Work hard - still get B's	3	2.1
Science or math grades	4	2.8
Other external problems: family, work, etc.	4	2.8

B. INFLUENCE ON CAREER CHOICE

Each young woman was asked to indicate in order of importance the four most significant influences on her choice of career.

IMPORTANCE OF INFLUENCES
(In percent of times chosen as 1st, 2nd, 3rd or 4th - N=483)

Influences	1st Choice	2nd Choice	3rd Choice	4th Choice	Total Times Chosen
Own interests	66.7	20.3	8.9	2.9	475
Own abilities	11.8	32.5	13.5	10.2	324
Courses	3.3	7.7	11.8	10.0	154
Activities	3.7	6.8	12.7	9.6	154
Knowing someone in the occupation	2.9	6.0	7.0	9.3	118
Own work experience	2.7	6.6	7.6	6.2	109
Books and pamphlets on occupations	0.4	3.7	4.9	8.0	79
Mother	1.2	3.9	4.4	6.4	75
Financial considerations	0.8	2.1	6.3	6.9	75
Father	2.3	3.3	3.2	5.6	67
Teachers	1.7	2.5	3.4	4.4	56
Relatives	0.6	1.7	4.4	5.3	56
Grades	0.2	0.4	4.4	5.6	49
Peers	0.4	0.8	2.3	3.3	32
Movies or TV programs	0.6	0.4	2.1	2.0	24
Physical capacity	0.4	0.8	1.7	2.0	23
Counselors	0.2	0.4	1.1	2.0	17

The young women are consistent in attributing strongest influences to what is within themselves, or to their own immediate experience.

"If you could find out anything you wanted to know about jobs or careers, what do you most want to know? Please rank the four items most important to you in the order of their importance. Write 1 after your first choice, and number your other choices 2 through 4."

OCCUPATIONAL INFORMATION DESIRED
(In percent of times chosen as 1st, 2nd, 3rd or 4th - N=493)

	1st Choice	2nd Choice	3rd Choice	4th Choice	Total Times Chosen
Kind of life a person is likely to have with a certain job (hours worked, working conditions, possibility of travel, etc.)	27.9	12.1	14.8	13.5	337
Education and training needed for various jobs	22.4	21.5	13.4	9.4	329
Skills and interests needed in various jobs	19.2	17.2	14.4	7.8	289
Kinds of jobs likely to be plentiful or hard to find in the future	13.1	14.2	10.8	15.2	262
Wages or salary paid on the job	2.0	8.3	11.6	17.4	193
People with whom you would be working	5.1	9.1	9.8	11.1	172
Duties of various jobs	5.9	9.9	10.2	8.6	170
Location of jobs that interest you	2.2	4.7	9.6	10.7	133
Chances for promotion in various jobs	0.6	2.2	4.7	4.7	60

An earlier survey by Thal-Larsen 1971 (42) in the same counties found education and training to be the most wanted information. It is a sign of the times that life style is now of greatest concern.

"In obtaining information about jobs or careers, how would you most like to get information? Please rank in the order of their importance to you the three means of receiving information listed below that are most attractive to you. Write 1 after your first choice, and number your other choices 2 and 3."

WAYS OF OBTAINING DESIRED OCCUPATIONAL INFORMATION
(In percent of times chosen as 1st, 2nd or 3rd - N=493)

	1st Choice	2nd Choice	3rd Choice	Total Times Chosen
Through people in the occupation	19.9	26.3	23.3	345
By actually seeing the work performed on various jobs	28.4	21.7	17.6	336
By working part-time or during vacations	23.7	17.3	10.7	257
By engaging in activities that are job-related	13.7	17.3	18.0	243
Through attending a "Career Day"	2.4	3.0	5.1	52
Through talks with a counselor	4.0	2.8	3.0	49
By reading about jobs books and pamphlets	2.0	3.6	4.0	48
In the content of your regular courses	2.6	1.8	4.9	46
Through talks with a teacher	0.4	1.8	4.3	32
In "world of work" courses describing many jobs	1.0	1.8	3.2	30
Through your parents and relatives	1.2	2.2	2.4	29
By watching movies, film strips or TV	0	0.2	2.4	13

The young women want to obtain their information through active, participative first hand means. They particularly do not care to learn from other people either at home or at school, or by passive viewing.

"Has any of the occupational information you have received to date significantly affected your career choice and/or your educational plans?"

	N	Percent
Yes	127	25.5
No	372	74.5

Of the quarter who acknowledge this influence, their description of content and source closely parallels the preceding assessment. Content emphasizes education, training and skills needed, and source own work experience, people in the occupation and books.

If Yes, result of effect of occupational information on Career Choice:

	Percent
Discouraged from Sci-Math	1.6
Encouraged towards Sci-Math	25.8
Encouraged towards other fields	13.3
Encouraged towards exploration	13.3
Encouraged towards preparing for education programs	25.8
Changed educational plans	10.2

C. INFLUENCES, SCIENCE AND RELATED

Extent of interest in Mathematics:

	Checked		Checked Highest	
	N	Percent	N	Percent
Am not interested in mathematics	113	22.6	109	21.8
Am about as interested in mathematics as in all or most of my courses	174	34.8	130	26.0
Am more intereted in mathematics than in most of my other courses	120	24.0	41	8.2
Plan to take more mathematics	173	34.6	102	20.4
Plan to take enough more mathematics to use as a tool or to constitute a major	119	23.8	117	23.4

The extent to which interest in Mathematics was increased or encouraged by (in percent)*:

	Not At All	Moderately	Very Much	Total: Moderately & Very Much
Activities	55.3	38.1	6.6	
Books and pamphlets about occupations	70.5	24.2	5.3	
Counselors	63.7	30.5	5.8	
Courses	9.6	34.8	55.7	90.5
Father	46.5	33.8	19.7	
Financial considerations	74.2	17.8	8.0	
Grades	19.7	43.2	37.1	80.3
Knowing someone in the occupation	69.9	20.4	9.7	
Mother	54.2	34.4	11.5	
Movie or TV program	95.6	4.4	0	
Own abilities	8.2	32.9	58.9	91.8

*In this and subsequent tables, only the items with greatest magnitude are presented in the final column for emphasis.

Mathematics was increased or encouraged by (in percent) (cont.):

	Not at All	Moderately	Very Much	Total: Moderately & Very Much
Own interests	6.6	31.1	62.3	93.4
Own work experience	57.5	28.9	13.6	
Peers	61.5	30.1	8.4	
Physical capacity	60.8	23.4	15.8	
Relatives and older friends	74.9	17.6	2.5	
Teachers	30.5	39.9	29.6	69.5

Encouraging influences for mathematics, the young women say, are their own interests, own abilities, courses, grades and teachers.

The extent to which their interest in Mathematics was decreased or discouraged by (in percent):

	Not at All	Moderately	Very Much	Total: Moderately & Very Much
Activities	65.7	27.6	6.7	
Books and pamphlets about occupations	82.5	14.7	2.8	
Counselors	89.2	9.6	1.2	
Courses	22.3	37.5	40.2	77.5
Father	86.1	10.8	3.2	
Financial considerations	93.7	5.6	0.8	
Grades	35.0	35.0	40.0	65.0
Knowing someone in the occupation	91.2	5.6	3.2	
Mother	88.9	9.9	1.2	
Movie or TV program	96.0	3.2	0.8	
Own abilities	21.5	37.9	40.6	78.5

Mathematics was decreased or discouraged by (in percent) (cont.):

	Not at All	Moderately	Very Much	Total: Moderately & Very Much
Own interests	7.8	29.4	62.7	92.1
Own work experience	70.9	20.7	8.4	
Peers	78.1	19.9	2.0	
Physical capacity	76.4	18.5	5.1	
Relatives and older friends	89.6	9.2	1.2	
Teachers	50.2	28.1	21.7	

Interests, abilities, courses and grades are the main discouragers reported for mathematics. Remembering that these are the responses of those young women who are positive towards math separated from those who are not, it is striking that in general the interaction of the immediate educational experience with internal traits accounts for either positive or negative reactions. Later interview data reveal earlier and more refined association, if not causality.

Extent of Interest in Science:

	Checked		Checked Highest	
	N	Percent	N	Percent
Am not interested in science	39	7.8	39	7.8
Am about as interested in science as in all or most of my courses	139	27.8	125	25.1
Am more interested in science than in most of my other courses	180	36.0	50	10.0
Plan to take more science	206	41.2	89	17.8
Plan to take enough additional science to qualify for an occupation in the field of science or in a related technology, or to constitute a major in science	195	39.0	196	39.3

Mathematics and science are not closely linked. Science is considerably more attractive, sixty-seven percent preferring it to other courses, versus fifty-two percent expressing more interest in mathematics.

Science interest was increased or encouraged by (in percent):

	Not at All	Moderately	Very Much	Total: Moderately & Very Much
Activities	24.6	44.4	31.0	75.4
Books and pamphlets about occupations	46.1	35.5	18.5	
Counselors	64.5	27.9	7.6	
Courses	5.1	30.9	64.0	94.9
Father	45.0	37.4	17.6	
Financial considerations	69.9	21.9	8.2	
Grades	17.8	48.5	33.7	81.2
Knowing someone in the occupation	44.8	24.5	30.6	
Mother	53.5	35.0	11.6	
Movie or TV program	72.7	19.4	7.9	
Own abilities	4.5	41.9	53.6	95.5
Own interests	2.7	14.6	82.7	97.3
Own work experience	53.3	24.2	22.4	
Peers	64.7	28.6	6.7	
Physical capacity	56.7	28.6	13.8	
Relatives and older friends	60.0	26.7	13.3	
Teachers	28.5	41.1	30.4	71.5

Like math, own interests and abilities are overriding, and courses, grades and teachers are prominent factors. For science, activities are rather important also.

Science interest was decreased or discouraged by (in percent):

	Not at All	Moderately	Very Much	Total: Moderately & Very Much
Activities	20.4	22.4	5.9	
Books and pamphlets about occupations	88.2	7.9	2.6	
Counselors	93.4	4.6	0.7	
Courses	30.8	38.5	29.5	68.0
Father	92.8	5.3	0.7	
Financial considerations	94.7	2.6	1.3	
Grades	48.1	32.5	18.2	50.7
Knowing someone in the occupation	92.1	6.6	1.3	
Mother	93.4	5.3	1.3	
Movie or TV program	92.8	5.3	0.7	
Own abilities	31.0	36.8	31.0	66.8
Own interests	10.3	32.1	56.4	88.5
Own Work Experience	80.8	12.6	5.3	
Peers	84.1	12.6	2.0	
Physical capacity	82.2	13.2	3.3	
Relatives and older friends	94.1	4.6	1.3	
Teachers	66.4	21.7	10.5	

The pattern of influences is much the same as for mathematics. Teachers appear to be far more often positive rather than negative influences.

The young women were asked to give open ended discussions of positive and negative influences.

"Overall, what experiences of any kind have you had that have tended to encourage you towards science and mathematics?"

	Percent
Family influence (brother, uncle, parents)	8.6
Interest, enjoyment, fulfillment	2.4
Curiosity, wanting to know	8.4
Been successful, done well	21.6
Instruction, teachers, classes	32.2
Like life sciences (animals, people, life processes, living things)	7.0
Work experience or opportunity to apply knowledge in or out of school	11.0
Influence of friends	0.8
Means to an end	9.6
External events - movies, etc.	5.6
Liking related or preparatory experiences - solving puzzles, etc.	0.8
Application to daily life and world	2.0
Influence of people interested in these professions	4.0
Desire to be unique	0.4
Concern for future or present	1.4

Again, own interest, success and factors related to educational experience are most frequently mentioned.

"To what extent do you feel that any of these experiences were related to the fact that you are a girl?"

	Percent
Not at All	73.9
Not Much	4.6
Some	1.6
Much	.6
No Degree Expressed	12.4

Over one-fifth expressed feelings of sex-related encouragement, in these ways:

	N
Encouraged because girl; more exposure because girl	15
Effect of competition with boys, proving as good as or better than most boys, overcoming greater difficulty	13
Impetus to exceed expectations for girls, more of a challenge; told wouldn't make it	10
Encouraged to upgrade aspirations because of changing situation and opening up of opportunities for women	9
Teachers more apt to help, encourage, be impressed when girls did well	4
Natural feminine traits, e.g., curiosity, receptivity to others	4
Fields male dominated should be broken up by women	4
Early limited exposure because female	3
Female teachers in science (model) and/or girls in classes	3
Changing social mores regarding male support - girls have to work	2
Downgraded aspirations	1
Counselor specially encouraged because girl	1

On the other side, they were asked: "Overall, what experiences of any kind have you had that have tended to discourage you from Science and Mathematics?"

	N
Lack of interest in math and science and more interest in other fields	67
Lack of own interest or dislike of math (find boring)	58
Poor math and science teachers	53
Poor math teacher(s) in general or before high school	38
Lack of own ability in math (difficult to comprehend, slow hard-going work, mental block)	37
Lack of ability in math and science	33
Lack of success in math and science	31
Lack of own interest in science	27
Lack of success in math (poor grades)	22
Difficulty and lack of success in math and science	22
Poor math teacher(s) in high school	19
Math not practically usable	17
Too competitive a field	15
Courses which were bad, slow moving (emphasis on content)	12
Difficulty and lack of success in math	11
Poor science teacher(s) in general or before high school	11
Lack of own ability in science (perplexing, difficult, time consuming)	10
Information about occupational field	10
Parents and/or siblings	10
Poor foundation, background in math and/or science or poor scheduling	9
Lack of information about occupational field	8
Few women in fields and/or classes	7

Poor science teacher(s) in high school	6
Homework	6
Neither practically usable or science not usable	6
The long and hard amount of schooling necessary for a career in science or math	5
Feel inadequate	4
Dissecting (animals, frogs, etc.)	4
Work experience (e.g. hospital)	3
Influence of people, friends, relatives	3
Lack of success in science courses	2
Difficulty of and lack of success in science	2
Dull, uninteresting textbooks; poor equipment	2
"Scientific" attitude towards life, i.e., impersonal	2
Social distrust of medical profession	1
Difficulty of getting into med schools	1
Some opportunities closed to women (firemen as prerequisite for paramedic)	1
People's views that these are "masculine" subjects	1

Loosely construed, these responses may be said to fall into these areas:

	N	Percent
Lack of interest, ability, success	326	64.2
Teaching of courses	160	31.5
Family and other people	13	2.6
Discrimination against women	9	1.8

It may, of course, have been that these responses were, to some extent at least, structured by the choices offered earlier for allocation of influences. Some seem to be individual, sophisticated and idealistic, e.g., social distrust of the medical profession, and distaste for the impersonality of the "scientific" attitude toward life!

Very few specify characteristics related to the learning process or occupation which have to do with their sex.

"To what extent do you feel that any of these discouraging experiences was related to the fact that you are a girl?"

	Percent
Not at All	70.7
Not Much	2.6
Some	1.6
Much	3.2
No Degree Expressed	10.8

In effect only twenty-four young women of the 499 who responded to this item considered that any discouragement from Math or Science was attributable to any real degree to their being a girl. Whatever social pressures may be, overt or subtle, the young women's own recognition does not incorporate them.

Of those few who mentioned in what way being a girl affected them, these were the total statements (not independent):

	N
Prejudice against girls; lack of encouragement or active discouragement	21
Put down by teachers (derogated), harder to get grades, teachers favoring boys or feeling threatened by girls	18
Pushed towards traditional feminine roles - lower expectations	12
Lack of female teachers in science (model) and/or girls in classes and/or women in science professions	4
Parents discouraged (including non-exposure to technical areas)	3
Greater difficulty in getting into medical schools or science related college programs	3
Inability to relate to women in science fields	3
Boys had better background	3

Girls' physiological differences - adolescent hormonal changes, less strength, competitiveness	2
Greater difficulty in careers	2
Have to struggle harder to attain goals	1
Can't compete with boys	1

In the original try-out of the F questionnaires, young women particularly from a private school which offered no official guidance had expressed appreciation for the opportunity of being made to think of themselves, themselves in relation to science and mathematics, and the career choice process. It seemed that the instrument itself might be, in these senses, a guidance tool.

The last question of the questionnaire was, "Has *this questionnaire*, in itself affected in any way your thinking about your educational and career planning?"

122 said Yes, and it affected them in these ways:

	N
Focussed thoughts toward planning and/or choice	55
Reaffirmed present self-evaluation and/or intensified recognition of interest in science	14
Made more aware of possibilities for the future	8
Caused to open up exploration of this field (science-math-technology)	6
Caused to recognize who and what really did or did not influence in choice of career	5
Caused to recognize not occupationally formed	5
Caused to recognize there are ways of getting career information	5
Being chosen for this study caused to think about a career in Science	5
Caused to question present choice of Science	5
Caused to question non-interest in Science (now seems exciting)	4
Caused to recognize importance of *women* in careers	3

Caused to recognize and reaffirm own independence in decision for career	3
Caused to question dislike ot Math (thus having eliminated Science)	2
Reaffirmed dislike of Math and/or Science	1

X. SCIENCE-BOUNDNESS

The difficult problem of establishing a criterion of science-boundness discussed in Chapter VII was resolved by using composite criteria, the best solution available under the given circumstances. Applying these criteria, the group of 500 young women divided into four subgroups characteristic of their orientation, as follows:

Orientation	Number in Subgroup	Percent in Subgroup
Science	101	20.2
Science-Math	60	12.0
Math	23	4.6
Other	316	63.2

Most of the 101 young women in the science-bound subgroup were found to be oriented to biological science, plant, animal or human. The above findings generally parallel those of other studies. In the MIT Women in Science and Technology Workshop in 1973 Astin (5) says "Physicists, mathematicians and engineers are expected to be in short supply by the end of the decade, and the Department of Labor predicts an oversupply of life scientists in the making. However, the life sciences are the most popular of all scientific careers women pursue."

Every item in the F Questionnaire was analyzed separately for each of the four groups. Despite weak validity and doubtful predictability value, differences were found between the groups on a number of items which proved to be statistically significant. The reporting in this section will concentrate on these discriminating items, as well as presenting a few descriptively interesting results, excluding, of course, those items involved in the composite criterion for separating the groups. Only usable responses are included, making N's sometimes small.

Generally, Group II, Science and Math oriented, with twelve percent of the total sample, appears to be the most able group. Astin 1971 (7) found that "boys and girls who chose to take both science and math scored higher on math and on science that those who chose to take either math or science only."

As previously indicated, PSAT Math scores are significantly higher for Groups I, II, and III than for Group IV. The groups vary significantly not only for PSAT Math Score means but also for the Math-minus Verbal (M-V) scores. There is no difference between groups on the Verbal score alone.

PSAT MEANS

Group	Verbal		Math		M-V		
	M	S.D.	M	S.D.	M	S.D.	N
Science	49.7	9.8	54.9	6.6	5.2	8.7	101
Sci-Math	50.7	9.7	58.5	7.5	7.9	8.5	60
Math	46.5	9.4	58.4	8.3	11.9	6.8	23
Other	50.1	9.7	55.0	6.4	5.0	8.7	316
Total	49.9	9.7	55.6	6.8	5.7	8.7	500

For the Mathematics and M-V scores, differences between Group means are significant by F-test beyond the .001 level. The more math oriented or math-bound the group, the greater the distance of the Verbal from the Math score.

Ethnic Identity

While no significant differences appeared in the science-boundness of ethnic groups, the distribution by ethnicity is of sufficient interest to report. Detailed differences between the two major subgroups, Caucasian and Asian, are presented in Chapter XII.

SCIENCE-BOUNDNESS BY ETHNIC IDENTITY (IN PERCENT)

Ethnic Identity	Science	Science-Math	Math	Other
Amer. Indian/Native Amer.	0	33.3	0	66.7
Black	12.5	12.5	12.5	62.5
Caucasian	18.9	10.8	4.7	76.2
Chicana/Latina	16.7	16.7	0	66.7
Chinese	26.8	14.1	4.2	54.9
Filipine	33.3	0	33.3	33.3
Japanese	21.7	21.7	0	56.3
Polynesian	40.0	20.0	0	40.0

Differences do not exist in regard to age, members of the household, whether natural or broken families, number of siblings, nor, interestingly, in birth order, contrary to the literature regarding men in science.

Parents' Educational Background

Probably because of the nature of this sample and its part in determining high levels of education and occupation of the parents, there were no statistically significant differences among groups for either father's or mother's education or occupation. In other studies it was found that the father's occupation, in particular if in a scientific field, is causative in developing children's interest. As a generality this does not apply for young women in this study. Foreing education, other than that incidentally acquired, proved important. Although the numbers are small, the differences are significant for the fathers at the .05 level and for the mothers at the .02 level.

FOREIGN EDUCATION (IN PERCENT)

	Father	Mother
Science	15.9	20.8
Science-Math	10.0	15.0
Math	4.0	8.6
Other	10.2	9.5

Science and Math Course Work

It is of general interest to look at the patterns of courses in science and math reported by this group. The differences between the four subgroups were significant. For science courses taken before the senior year the distribution is bimodal.

CLASS PROGRAM, SENIOR YEAR (IN PERCENT)

Course Pattern	Sci	Sci-Math	Math	Other	Total
No Sci - No Math	4.0	3.3	13.0	21.8	15.6
1 Sci - No Math	7.9	3.3	0.0	16.5	12.4
2 Sci - No Math	42.6	18.3	21.7	29.1	30.2
1 Math - No Sci	0	0	0	3.2	2.0
2 Math - No Sci	2.0	5.0	8.7	4.7	4.4
1 Sci - 1 Math	2.0	6.7	8.7	4.1	4.2
2 Sci - 1 Math	7.9	15.0	8.7	6.3	7.8
2 Sci - 2 Math	33.7	48.3	39.1	12.0	22.0

NUMBER OF SCIENCE COURSES TAKEN PRIOR TO SENIOR YEARS (IN PERCENT)

Number of Courses	Sci	Sci-Math	Math	Other	Total
1	0	0	0	1.3	0
2	5.9	1.7	4.3	9.5	7.6
3	15.8	11.7	8.7	23.1	19.6
4	26.7	23.3	26.1	30.4	28.6
5	12.9	15.0	26.1	8.9	11.2
6	13.9	20.0	17.4	11.7	13.4
7	5.0	6.7	0	2.5	3.4
8 or more	19.8	21.7	17.4	10.1	13.8

Science Course Grades

As indicated earlier, the Sci-Math, Other, and Science groups, in that order had the highest PSAT Verbal mean scores; in each case, however, they were lower than the Math mean scores. Nonetheless, the grades obtained in the Social Sciences and English were throughout higher than the grades in Science and particularly Mathematics. This accords with repeated mentions in questionnaires and interviews of the difficulties encountered in studying Mathematics and the Physical Sciences. Some of those interviewed considered these difficulties to be intrinsic to the subject matter and indeed welcome, others thought of this as a drawback. The question which arises is the degree to which the perceived greater difficulty of these subjects is actually intrinsic and the degree to which it is due to the teaching and grading.

COURSE GRADE DISTRIBUTIONS

Group	Grade						
	A	A-	B+	B	B-	C+	C
Science							
English	44.6	12.9	13.9	26.7	0.0	0.0	2.0
Math	21.8	11.9	9.9	41.6	6.9	1.0	6.9
Social Studies	60.4	7.9	5.9	19.8	1.0	2.0	3.0
Science	38.6	10.9	12.9	31.7	3.0	0.0	2.0
Science-Math							
English	50.8	8.5	15.3	25.4	0.0	0.0	0.0
Math	33.3	13.3	5.0	33.3	8.3	1.7	5.0
Social Studies	65.0	13.3	5.0	16.7	0.0	0.0	0.0
Science	40.0	20.0	11.7	25.0	3.3	0.0	0.0
Math							
English	34.8	8.7	26.1	21.7	4.3	4.3	0.0
Math	47.8	13.0	8.7	26.1	4.3	0.0	0.0
Social Studies	39.1	17.4	13.0	17.4	4.3	8.7	0.0
Science	30.4	17.4	8.7	34.8	4.3	0.0	4.3
Other							
English	49.8	12.7	13.7	21.9	1.3	0.0	0.6
Math	28.4	10.5	13.4	33.8	7.0	3.8	11.1
Social Studies	56.2	10.2	9.5	19.4	2.2	0.3	2.2
Science	32.7	10.0	10.0	32.7	3.9	2.9	7.4

Extra Curricular Activities

Regardless of orientation, the extra-curricular activity involvement of these bright, motivated, achieving young women is considerable. The sheer number of such activities does not differentiate between the three science oriented and the "other" group. But, as may be expected, activities with science-related aspects are significantly more prevalent among the science-oriented young women, as shown in the attached table.

SCIENCE-RELATED ACTIVITIES (IN PERCENT)

	School Activities		Clubs		Paid Work	
Number of Sci-Related	Sci, Sci-Math, Math	Other	Sci, Sci-Math, Math	Other	Sci, Sci-Math, Math	Other
None	25.3	41.8	60.8	74.9	60.3	40.2
1	37.7	29.6	20.8	21.4	30.2	23.3
2	23.6	21.1	6.6	2.7	7.3	6.6
3	12.1	6.3	1.7	1.0	2.2	0
4	2.2	1.0	1.1	0	0	0
5	0.5	0	0	0	0	0
6	0.5	0.3	0	0	0	0

Preferences, Interests

As for the next section of the questionnaire, that on Preferences, it was introduced to determine whether personality characteristics might distinguish the potentially science-bound at this stage, and thus throw light upon components or bases of interest. Statistically significant differences were found on four of the seventeen items, all in favor of the science-bound:

-Solve puzzles or problems;

-Take things apart to see how they work;

-Do things that will improve society;

-Do things independently of others.

Astin et al, 1974 (6), cites Lovett's study, a doctoral dissertation completed in 1968 at the University of California, Berkeley, on "Personality Characteristics and Antecedents of Graduate Women Students in Science." Lovett reported that women scientists are consistently more non-person (i.e.

object) oriented and had parents who encouraged independent self-reliant children. Fetters, 1972 (17), in a national longitudinal study of the high school senior class of 1972 says that when it comes to selecting a job or career, the two factors most often marked on a list of ten as being very important were the opportunities to be helpful to others or useful to society and the opportunities to work with people rather than things. In the present study the science oriented students are even more idealistic than the above norm but are not especially committed to working with people and indeed distinctly prefer independent intellectual activities, much in accord with Lovett's findings.

Of relevance also is a quote taken from Eiduson and Beckman's 1973 summary (15) of the literature on personality characteristics of established scientists and young people interested in science (both sexes): "In a similar vein, McClelland, using adult scientists (in this case physical scientists), attempts to find the genesis of some of the characteristics which regularly turn up in studies of the personality of scientists, such as their pull toward the rational and the logical in thinking, their attempts to reject impulsiveness, their preoccupation with things rather than people, their social aloofness and their interest in nature." Our young women clearly show some affinity to the stereotype of the scientist, albeit with a degree of variation as between the three groups of science, science-math and math oriented young women. Of note is the fact that sixteen percent of groups 1, 2 and 3 express desire to work with children as compared with thirty-two percent of the "Other" group.

Ultimate Level of Education Intentions

The ultimate level of education aimed at gives differences significant beyond the .001 level, the science and science-math groups setting their sights highest.

ULTIMATE LEVEL OF EDUCATION AIMED AT (IN PERCENT)

	Sci.	Sci.-Math	Math	Other
Vocational training (as in trade or business school)	0	1.7	0	0.3
Some college education	1.0	0	0	1.6
Junior or community college graduation	3.0	0	0	0.6
Four year college graduation	15.8	5.0	21.7	21.3
Some graduate or prof. school	11.9	3.3	8.7	11.5
Higher graduate degree				
Masters (as MS;MA)	14.9	18.3	26.1	31.2
Doctorate (as Ph.D.; D.Sc.)	10.9	18.3	4.3	13.4
Professional (as Med. or Law)	39.6	53.3	13.0	11.8

Parental Expectations and Aspirations

Parental expectations have regularly emerged as an important determinant of level of education aimed at, and the present study is no exception. Cooley 1963 (11) found that among twenty environmental factors assessed, only parental expectation and aspiration levels were related to planning or not planning a career in science in the ninth grade. The present data on young women at a more advanced stage of their education gives strong support to the importance of the role of parental expectations. Rever 1973 (34) notes that "In general, it seems safe to conclude that during the high school years... parental expectations and aspirations operate to influence college attending or not attending and therefore serve to separate those developing toward science or technology only to the degree that training requirements differ." This again is well substantiated here, and perhaps more so.

Between the groups there are no significant differences in the numbers of either parent reported as aiming for a particular educational level for their daughter. But of those who are stated by the daughter to have expressed an aim, there are significant differences for both parents, the father beyond the .001 level and the mother at the .03 level.

Between the groups there are no significant differences in the numbers of either parent reported as aiming for a particular educational level for their daughter. But of those who are stated by the daughter to have expressed an aim, there are significant differences between the first three as against the "other" groups for both parents, the father beyond the .001 level and the mother at the .03 level.

	Father Percent	Mother Percent
Science	83.8	84.2
Science-Math	88.1	88.1
Math	85.7	78.3
Other	76.1	77.9

LEVEL OF DAUGHTER'S EDUCATION DESIRED BY PARENTS (OF PARENTS REPORTED AS CONCERNED)

	Fathers		Mothers	
	Sci, Sci-Math, Math	Other	Sci, Sci-Math, Math	Other
Vocational training (as trade or business school)	.5	0	0	.3
Some college education	3.3	3.5	2.7	5.1
Junior or community college graduation	.5	.6	1.1	.6
Four year college graduation	35.0	40.1	38.8	41.7
Some graduate or prof. school	8.2	7.3	7.7	7.1
Higher graduate degree				
Masters (as MS; MA)	6.6	13.1	9.3	13.5
Doctorate (as Ph.D.; D.Sc)	5.5	4.1	4.4	4.2
Professional (as Med. or Law)	24.0	7.0	20.8	6.1

Expressions of parental aims for their daughters are not, of course, confined to educational targets. They reach beyond, to actual professions, vocations, occupations. But while there is no significant difference between the proportion of mothers reported to have voiced occupational aims for the science-oriented young women and those not so oriented, the difference in the proportion of fathers is significant:

"Would your father like you to aim for a particular job or career?"

	Sci.,Sci.-Math, Math-Related	Other
Yes	27.3	18.5
No	57.9	65.8

But, of those 126 young women whose mothers have an aim for them, fifty-six are science-bound and seventy are not. The actual occupational desire of the mother for her daughter is of interest.

	Sci., Sci.-Math, Math	Other
Veterinarian	3	0
Science & Pract.- Human, Medical	3	4
Dietician	0	2
Pharmacist	2	0
Physician	21	6
Psychologist	0	1
Nurse	5	4
Occu. Therapist	0	1
Phys. Therapist	1	0
Scientists- Phys. Sciences	1	2
Architects	1	1
Engineers	3	0
Accountant	4	3
Medical Tech.	3	0
Dental Hygienist	2	0
Sci., Sci.-Math, Math SUBTOTAL	49	24
Sociologist	0	2
Athlete	0	1
Dancer	0	3
Journalist, Writer	0	5
Linguist	0	1
Musician	0	3
Other Arts, etc.	1	2
Lawyer	2	3
Social Worker	0	1
Secondary Teacher	3	9
Business Manager	0	6
Retail Selling	0	1
Secretary	1	5
Clerk	0	1
Airline Stewardess	0	2
Police	0	1
TOTAL	56	70

Self-Perceived Influences

O'Hara 1967 (26) concluded from a study of boys that the self-concept as he defined it adds to the predictability of the direction of vocational choice. His results suggested that the understanding of one's own aptitudes was more important in predicting science career choice than were aptitude measures. Not so for our group of young women. While PSAT scores have already been shown to distinguish significantly between groups, this has not yet been demonstrated for self estimates of ability and reactions to high school grades, either by self or by parents.

Neither time planned for marrying nor length of intended life-time employment characterized the science-bound group differently than the total.

The young women's statements on influences on career choice as perceived by them are presented in approximate rank order by group, with 1st, 2nd and 3rd choices summed and expressed in percentages. There are some significant differences, and major divergencies are underlined.

	Science	Sci.-Math	Math	Other
Own Interest	99.1	98.2	91.3	94.7
Own Ability	43.8	46.5	60.5	51.1
Courses	24.5	36.2	13.0	23.1
Activities	26.9	13.8	12.9	22.1
Father	6.3	20.7	21.7	6.3
Books about occs.	13.5	12.1	8.6	7.1

It is well known in the psychological literatures of measurement, prediction and counseling that, with very superior intellectual ability, interest is the prime determinant of occupational choice. The above data fully support the previous findings. In the case of the Mathematics group, the recognition of special ability appears to be a predicting factor directionally. Hypothetically, courses are particularly important contributors to interest for the Science-Math group and least important for the Math group. The father's influence is most strongly felt where Math is involved, for both Sci.-Math and Math groups. Lovett, 1968, notes that women with a scientific bent identify more with their fathers than with their mothers. Rever, 1973 (34) insists that "the studies of parental identification and interest development leave a number of hypotheses in need of investigation. Some differences were observed in the dominance of and the identification with either parent and entry into one ot the sciences." In the present study some of the positive and negative parental influences were clarified in the interviews (See Chapter XII).

It is gratifying to find that external knowledge gathered through activities and book is given credit for influencing choice to a greater extent in science than Math or in Other choices. In this respect our young women believe that occupational information has significantly affected their career choice and/or educational plans, especially those in the science-math oriented group.

Oriented to Science	27.7 %
Oriented to Sci.-Math	41.7 %
Oriented to Math	21.7 %
Oriented to Other	21.9 %

Significance is at the .01 level.

The way in which career choice has been affected is summarized in the following table.

EFFECT OF INFORMATION ON CAREER ORIENTATION

	Science		Sci.-Math		Math		Other		Total
	N	Percent	N	Percent	N	Percent	N	Percent	N
Discouraged from Sci.-Math	0	0	1	4.0	0	0	1	1.4	2
Encouraged towards Sci.-Math	13	46.4	12	4.8	3	60.0	5	7.1	33
Encouraged towards Other Fields	0	0	0	0	1	20.0	16	22.9	17
Encouraged towards Exploration	3	10.7	1	4.0	1	20.0	12	17.1	17
Encouraged towards Prep. for Educational Programs	8	28.6	6	24.0	0	0	19	27.1	33
Changed Educational Plans	4	14.3	1	4.0	0	0	8	11.4	13

Few encouragers towards Math showed significant differences:

Books and Pamphlets	Sci., Sci.-Math, Math	Other
Very Much	6.2	4.4
Moderately	31.9	16.7
	38.1	21.1
Knowing Someone in the Occupation		
Very Much	18.5	21.1
Moderately	16.7	2.6
	35.2	23.7
Counselors		
Very Much	3.5	8.0
Moderately	38.6	22.3
	42.1	30.3

Discouragers towards Math especially for science-bound are reported as significant even though numbers are very small and consequently misleading.

Own Work Experience	Sci., Sci.-Math, Math	Other
Very Much	34.8	9.7
Moderately	19.6	18.8
	44.4	28.5
Own Ability		
Very Much	28.4	41.3
Moderately	38.8	41.3
	67.2	82.6
Physical Capacities		
Very Much	5.5	4.8
Moderately	49.6	14.9
	55.1	19.7
Fathers		
Very Much	8.0	1.1
Moderately	46.6	8.6
	54.6	9.7
Counselors		
Very Much	9.0	0.5
Moderately	43.4	7.6
	52.4	8.1

Encouragers towards Science are more commonly experienced by the young women to a significant degree. They are presented here but not in rank order of strength of effect.

	Science		Sci.-Math			Math	Other	
Books about Occupations	N	Percent	N	Percent	N	Percent	N	Percent
Very Much	29	29.3	14	23.7	1	7.1	17	10.8
Moderately	43	43.4	23	39.0	4	28.6	47	29.7
Not At All	27	27.3	22	37.3	9	64.3	94	59.5
Counselors								
Very Much	13	13.1	4	6.8	1	7.1	7	4.4
Moderately	34	34.3	24	40.7	5	35.7	29	18.4
Not At All	52	52.5	31	52.5	8	57.1	122	77.2
Father								
Very Much	15	15.2	24	40.7	3	21.4	16	10.2
Moderately	32	32.3	23	39.0	5	35.7	63	40.1
Not At All	52	52.5	12	20.3	6	42.9	78	49.7
Financial				(Sci., Sci.-Math, Math)				(Other)
Very Much and Moderately				40.4				19.0
Mother								
Very Much	10	10.2	13	22.0	1	7.1	14	8.9
Moderately	38	38.8	23	39.0	7	50.0	47	29.7
Not At All	50	51.0	23	39.0	6	42.9	97	61.4
Own Ability								
Very Much	61	61.0	43	71.7	5	35.7	69	43.7
Moderately	34	34.0	16	26.7	9	64.3	80	50.6
Not At All	5	5.0	1	1.7	0	0	9	5.7
Own Work Experience								
Very Much	28	28.3	19	32.2	0	0	27	17.1
Moderately	32	32.3	14	23.7	2	14.3	32	20.3
Not At All	39	39.4	26	44.1	12	85.7	99	62.7

Physical Capacities	Science N	Science Percent	Sci.-Math N	Sci.-Math Percent	Math N	Math Percent	Other N	Other Percent
Very Much	15	15.0	15	25.4	2	14.3	17	10.8
Moderately	35	35.0	14	23.7	6	42.9	39	24.8
Not At All	50	50.0	30	50.8	6	42.9	101	64.3
Relatives & Older Friends								
Very Much	17	17.2	10	16.9	2	14.3	15	9.5
Moderately	38	38.4	14	23.7	4	28.6	32	20.3
Not At All	44	44.4	35	59.3	8	57.1	111	70.3

Teachers' influence does not nearly approach significance in differential emphasis in the groups.

No factors were stated as discouraging to any extent. For the non-science oriented group, twenty-nine percent reported that courses decreased their interest in science.

When the young women were asked: "Overall, what experiences of any kind have you had that have tended to encourage you towards Math and Science?" the number of mentions are as follows:

	Sci.	Sci.-Math	Math	Other
1. Interest, enjoyment, fulfillment (general)	31	16	10	105
2. Curiosity, wanting to know	7	5	3	27
3. Been successful, done well, and have the ability	19	15	8	66
4. Likes life sciences (animals, people, life processes, living things)	10	2	0	23
1-4, Subtotal	67	38	21	221
5. Instruction, teachers, classes, counselors	26	26	10	99
6. Family Influence (brother, uncle, parents)	9	5	1	28
7. Work experience or opportunity to apply knowledge in or out of school	17	11	2	25
8. External events - movies, outside reading, demonstrations, occupational information	9	2	1	16
9. Means to an end (a good career, money, etc.)	13	7	1	26
7-9, Subtotal	39	20	4	67

"To what extent do you feel that any of these experiences was related to the fact that you are a girl?"

	Science		Sci.-Math		Math		Other	
	N	Percent	N	Percent	N	Percent	N	Percent
Much	2	2.0	0	0	0	0	1	0.3
Some	1	1.0	1	1.7	0	0	6	1.9
Very Little	3	3.0	2	3.3	0	0	18	5.7
Not At All	71	70.3	46	76.7	19	82.6	233	74.0

These differences are far from significant, but we can recognize that exceedingly few of the young women felt that their sex was a factor, even in the case of their moving toward Science. This is interesting anecdotally in that several young women in their interviews stated that they thought women were advantaged now, but that by the time they had completed their preparation this would likely no longer be the case.

The ways in which being a young woman tended to encourage them do not differ by groups and the numbers are too small to report.

Whereas encouragement does not differentiate the science-bound young women, discouragement does.

"Overall, what experiences of any kind have you had that tended to discourage you from Science and Mathematics?"

A summary of the first statement responses is as follows, in percentage form.

	Sci.	Sci.-Math	Math	Other
Lack of interest, ability, success	39.7	36.5	47.7	52.5
Teaching or courses	29.8	25.1	17.3	24.6
Occupational field	10.0	11.7	0	10.7
Family and other people	1.0	3.4	4.3	0.6
Discrimination against women	0	5.0	0	0.9

These differences are in the expected direction.

"To what extent do you feel that any of these experiences was related to the fact that you are a girl?"

As was evident in earlier data presentation only about twenty-four of all of the young women signified that this was true to any appreciable extent. Of these fifteen are not Science-Bound, seven in the Science group, two in the Science-Math, and none in the Math group. Again, the comments themselves do not show differences in the groups. The effect of the questionnaire also did not show differences for the various groups.

SUMMARY

The composite criterion for science-boundness of these young women at the beginning of their senior year in high school holds up to the extent that there are significant differences among the four groups which were developed: Science, Science-Math, Math and Other, and between the first three and the fourth. The young women oriented to both science and math are the strongest in ability and perhaps in the assurance that they will reach their objectives. The Science group is less interested or more disinterested in math, and the Math group feels likewise about science. In some way the Math group is more like the "Other" group which is perhaps to be expected in view of the occupational definitions used here. A number of occupations in the "Other" group, especially in the social sciences, require analytical ability and to an extent mathematical ability, and so they overlap.

Even within this group of 500 young women selected for their mathematical and scientific aptitude, those who do at this time veer in those directions are superior in this aptitude. Foreign education of both parents was associated with science-boundness, possibly because of bilingualism of the children and the relatively lesser verbal demands in the science or math areas.

Social Science and English grades were higher for the science-bound group than their science and math grades, supporting their statements both of difficulty of science and math course work and of the attraction of that difficulty.

The science-bound young women took more science and math courses and engaged in more activities, clubs and paid work experience in science-related fields than did their non-science oriented peers.

They further characterize themselves in personality attributes as preferring to:

- Solve puzzles and problems;
- Take things apart and see how they work;
- Do things that will improve society;
- Do things independently of others.

They are aiming high educationally, largely for advanced graduate education.

Parents' expectations are a factor too, particularly for specific educational levels, as well as for specific occupations for the science-bound young women.

The major influences on career choice, as specified by the science-bound young women, are their own interests, own abilities, courses, their activities, their father and books about occupations.

Young women oriented toward math were encouraged towards it by books and pamphlets, knowing someone in the occupation and counselors; discouraged toward it by their own work experience, their own ability, their physical capacity, their father and their counselors. Encouragement toward science was attributed to books about occupations, counselors, fathers, financial considerations, mothers, own ability, own work experience, physical capacity and even relatives and older friends. No factors were stated as discouraging to any extent.

In free, open-ended evaluation of experiences, and of the relationship of their sex to their experiences, the science-bound young women do not differ in encouragement, but do differ in what they say about discouraging factors. Mathematics interest appears to be one of these discouraging factors to the Science group to a relatively major extent, and the Mathematics group feels the same about science. The Science and Sci.-Math groups complain more about poor math and science teaching, the Science group especially about math teaching before high school.

XI. SEX DIFFERENCES

The rationale of obtaining a generally comparable male sample was, simply, to distinguish those characteristics of the young women which might be due to their being females rather than to their being students. For this purpose the items which were deemed most critical or potentially significant on the questionnaire which was administered to the young women were excerpted to form the Student Questionnaire - M. This form comprised eight pages compared with twenty-six for Student Questionnaire - F (see Appendix B). The salient questions asked of the young women regarding which experiences, encouraging and discouraging, were due to being a female could not, of course, be transposed.

Among the available comparisons between the 500 young women and 102 young men selection has been made for presentation of only those which show differences or, failing that, are intrinsically interesting.

It should be remembered that there are differences in the sampling per se. The young men were drawn from fewer schools, those most apt to yield largest numbers. The pool was large enough to afford less concern about attrition. Some of the comparison data which will be first discussed bear partly upon the difference in the sample and may thereby dilute somewhat the sex difference found.

Male responses were analyzed by science-bound vs. non-science-bound for closer cross comparisons.

The young men, both science-bound and non-science-bound, proved to be higher in math scores on the PSAT. The same cutting score was used for both females and males to establish the populations from which the samples were drawn, but these scores represented different percentile ranks, lower for the males. For example, a score of 45 on the math test represented the 69th percentile for all male juniors nationally and the 79th percentile for all female juniors.

PSAT SCORES FOR MALES AND FEMALES BY SCIENCE-BOUNDNESS

Verbal Scale, Total Group	Female	Male
Mean	49.9	48.8
Standard Deviation	9.7	10.6
Number	500	102
Science-Bound		
Mean	49.6	49.2
Standard Deviation	9.7	10.6
Number	184	55

Non-Science-Bound	Female	Male
Mean	50.1	48.4
Standard Deviation	9.7	10.6
Number	316	47
Mathematical Scale, Total Group		
Mean	55.6	59.4
Standard Deviation	6.8	7.2
Number	500	102
Science-Bound		
Mean	56.5	60.8
Standard Deviation	7.3	7.3
Number	184	55
Non-Science-Bound		
Mean	55.0	57.7
Standard Deviation	6.4	6.9
Number	316	47
Mathematical Scale minus Verbal Scale, Total Group		
Mean	5.7	10.6
Standard Deviation	8.7	9.8
Number	500	102

In the non-science-bound groups the young men are lower verbally, overall stronger quantitatively.

Maccoby and Jacklin, 1974 (23) summarize the literature by stating that among sex differences that are fairly well established is the fact that young men excel in mathematical ability, and that young women have greater verbal ability than young men. "Beginning at about age 12-13, boys' mathematical skills increase faster than girls'. The greater rate of improvement appears to be not entirely a function of the number of math courses taken, although the question has not been extensively studied."

The demographic features of the composition of the groups showed some differences, not wholly explicable, as previously indicated. The young women are younger: eighteen percent are sixteen but only seven percent of the young men are sixteen, one of these young men being actually under sixteen. These findings are in accord with developmental literature describing the earlier, more rapid development of young women and their earlier effective school achievement. Of the young women sixty-one percent reported on the PSAT B+ through A grades, as did fifty percent of the young men.

ETHNIC BACKGROUND (BY PERCENT)

	Female		Male	
Black	1.6		2.9	
Caucasian	76.2		84.3	
Chicano	1.2		1.0	
Chinese	14.2	20.4	7.8	11.8
Filipino	.6		1.0	
Japanese	4.6		2.0	
Polynesian	1.0		1.0	

The greater proportion of Asian young women may be due to a lesser effort to obtain full participation on the part of the young men, although also the schools were used which yielded the largest number of Asian young women. Other factors may be conjectured, such as greater conformity on the part of the young women and thus greater willingness to participate.

FATHER'S OCCUPATION (SELECTED CATEGORIES) (BY PERCENT)

	F	M
Professional & Managerial	58.4	69.7
Life Sciences - Plants, Animals	2.4	2.0
Life Sciences - Human, Medical	8.2	6.9
Physical Sciences	1.6	3.9
Engineering, etc.	14.8	21.6
Mathematics	.6	0
Computer Science	2.2	2.0
Science - Any Level	51.0	51.2

It is of special interest that a very much higher percentage of the fathers of the young men are in physical sciences, engineering and technology than are the fathers of the young women. This is in spite of a remarkably high degree of science related occupations and remarkable similarity overall. If replicable, it could give rise to a wild fantasy that men in physical sciences and technology are more likely to have male offspring, and those in biological sciences to have female!* Or can it be that fathers influence their offspring differentially by sex or that young men and young women respond differentially to fathers' interests?

The mothers' housewife (or household engineer) status is pretty similar: thirty-five percent for the young women and thirty-nine percent for the young men.

And so how do the sexes compare in being Science-Bound?

	Female		Male	
	N	Percent	N	Percent
Science-Bound Total	184	36.8	55	53.9
Group 1, Science	101	20.1	18	17.6
Group 2, Science-Math	60	12.0	27	26.5
Group 3, Math	23	4.6	10	9.8
Group 4, Non-Science-Bound	316	63.2	47	46.8

Other things being equal, the males with math-science aptitude appear to have considerably more intention of taking advantage of it. To a considerably greater extent than the females they are math oriented for their futures which is demonstrated in both Groups 2 and 3. There is less sex difference evidenced for science orientation, particularly biological sciences, than when mathematics is involved.

Their specific statements of immediate plans for taking more mathematics are confirmatory. In their senior year, sixty eight percent of the young men plan to take one or more math courses compared to thirty-four percent of the young women. Before the senior year forty-three percent of the young men had taken eight or more math courses compared with thirty-eight percent of the young women.

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*While not located in the literature, an NSF official reports familiarity with a similar finding a number of years ago.

INTEREST IN MATHEMATICS AND SCIENCE, HIGHEST LEVEL CHECKED (BY PERCENT)

	Math		Science	
	F	M	F	M
Not interested	21.8	3.9	7.8	2.9
About as interested as in all or most of my courses	26.0	16.7	25.1	13.7
More interested than in most of my other courses	8.2	6.9	10.0	9.8
Plan to take more	20.4	28.4	17.8	23.5
Plan to take enough more (to use as a tool or to constitute a major)	23.4	44.1	39.3	50.0

Over one-fifth of the young women declare disinterest in mathematics, despite being, as a group, only slightly less able quantitatively than the young men. Is the greater success in math by young men in early adolescence related to differences in interest, or emerging sex role differences with adolescence, or is the greater disinterest on the part of the young women a function of less ability? This is a critical question which needs study before and during adolescence.

Maccoby and Jacklin (23) also find that it is not true that young women have lower self esteem than young men. "The sexes are highly similar in their overall self-satisfaction and self-confidence throughout childhood and adolescence."

In this particular study, that does not seem to obtain.

SELF-ESTIMATE OF OVERALL SCHOLASTIC ABILITY (BY PERCENT)

	Verbal Ability		Quantitative Ability	
	F	M	F	M
Very Superior	7.5	12.9	4.4	19.8
Superior	38.1	44.6	54.1	63.4
Average	47.7	37.6	40.2	16.8
Below Average	6.7	5.0	1.2	0
Mean PSAT Scores	49.9	48.8	55.6	59.4

Career Directions

The general findings reported above of sex differences in science-boundness accord fully with Hansen and Naujahr's 1973 (18) study of 600 high school students in the Columbia University Honors Program between 1959 and 1962, with follow-up in 1971 and 1972. In the follow-up there were 228 men and seventy-three women. Intelligence was the same but the young men had significantly higher scores than the young women on tests of ability and interest in math and science. The young men were more likely to intend to major in physical science or math. The young women were more likely to intend to plan for biological science. In the follow-up, many of the same differences and similarities persisted into college and graduate school. More men than women actually majored in science and math.

Studies of achievement reveal these differences also. In the largest and most ambitious educational survey project in the nation (25) ten learning areas were assessed. In science (1969-1970 and 1972-1973) males show an advantage at all ages. At age nine, male overall performance is only two percent above that of females; at age thirteen, three percent above; at age seventeen five percent above; at ages twenty-six and thirty-five ten percent above that of females. At all four age levels, males demonstrated a more thorough knowledge of physical science and females seem to have a better knowledge of biological science.

Recent national survey data are largely reinforcing. The Cooperative Institutional Research Program (A.C.E. and U.C.L.A.) directed by Astin (7), surveying entering college freshmen, reports:

PROBABLE CAREER OCCUPATIONS (SELECTED) - 1973-74 (BY PERCENT)

	F	M
Engineer	1.5	13.5
Farmer or Forester	1.6	6.6
Nurse	9.1	0.1
Research Scientist	2.3	3.9
Doctor (M.D. or D.D.S.)	5.8	12.5
Health Profession (non M.D.)	16.5	6.5

The College Entrance Examination Board's report (2) on the first choices of intended field of study in 1973-1974 of college-bound seniors for selected fields tabulates the following findings:

INTENDED FIELD OF STUDY (BY PERCENT)

	California		National	
	F	M	F	M
Agriculture	2	4	1	4
Architecture	1	4	1	3
Biological Sciences	14	19	10	15
Computer Science	1	2	1	1
Engineering	0	8	0	10
Mathematics	2	4	3	4
Nursing and Other Health	1	2	18	2
Physical Science	2	6	2	6

In these data, the occupational level plays a part. The data are, of course, not directly comparable to the findings of this study with its special sample, but they do provide general base rate information.

Noteworthy in the present study is that fifty-five percent of the young women professed themselves to be undecided as to college major at this time, as did forty-three percent of the young men. In regard to career choice, fifty-eight percent of the young women are undecided compared with fifty-two percent of the young men.

Maccoby and Jacklin (23) classify as an open question whether there are sex differences in nurturance and "maternal" behavior. Our indirect evidence on this point from this study derives from the spontaneous designation of intended career choice. From these designations statements were tallied specifically indicating application of the intended discipline to children. Of the young women, twenty-six percent so specified. Exactly one of the 102 young men did so, stating that he intended to become a pediatrician.

There are relatively few differences between the young women and the young men in their assessment of what has influenced their career choice. Combining first and second rankings of influence, eighty-seven percent of the young women emphasized their own interests compared to seventy-five percent of the young men. In reference to abilities, forty-four percent of the young women find this a major influence while only twenty-three percent of the young men do so. While the young men regard these influences as important, they place less emphasis upon them than do the young women. One other influence shows differences - the father. Of the young men, eleven percent feel strongly influenced by him, but only six percent of the young women do.

Personal preferences were largely similar, but showed a few curious but probably comprehensible differences. "Solve puzzles or problems" for the young women showed differences significant at the $P < .001$ level between science-bound and non-science-bound. However, there was not a significant difference for the young men between the two groups, raising a question of sex differences in this preference. "Take things apart to see how they work" differentiated the science-bound from the non-science-bound beyond the .001 level for the young women; only at the .01 level for the young men. "Study foreign languages", while not significantly differentiating non-science-bound from science-bound young women, does differentiate for the young men who are non-science-bound from those who are not, at the .02 level. Dooley finds that when looking specifically at the relationship between the kinds of courses taken and development toward a science or technology career, science and technology groups tend to take less foreign languages and more math than their peers. This apparently applies less to young women, already generally reported by Maccoby and Jacklin (23) to excel in verbal ability.

An open - ended expression, factors which have encouraged and/or discouraged an interest in science and math, which seem to be more than differences in verbal production, are evident. For encouragement towards science and math, liking, enjoyment and interest are mentioned by twenty-six percent of the young women and by forty-two percent of the young men. School related factors are mentioned by twenty-four percent of the young women and by only nine percent of the young men. This suggests that, relatively, the young men are more responsive to inner factors and the young women to outer factors. Since the checklists were not included in the Male Questionnaire this hypothesis could not be further developed.

For discouraging factors, lack of interest is mentioned by twenty-seven percent of the young women and by thirteen percent of the young men. All school related factors are noted by forty-six percent of the young women and by thirty-six percent of the young men. Poor teachers bother more young men, fifteen percent compared to eleven percent of the young women.

SUMMARY

In these two groups of young women and young men, selected to exceed a uniform standard aptitude for science-technology-math, in the main many similarities exist in attitudes, outlook and evaluation of their experiences. Few subjective statements speak positively to the major question: Are the problems, difficulties and obstacles encountered by the young women sex-related, or conversely, is special encouragement received? Most responses to duplicate items are essentially similar with a few notable exceptions.

Frequency of science-boundness is clearly greater for the young men, especially so for the espousal of math. The young women are more likely to favor biological sciences. The young men's greater interest and strength in math appears in a number of contexts.

A puzzling finding is that more of the young men's fathers are employed in physical science and technology occupations; more of the young women's in biological sciences. Since the groups were selected for aptitude rather than intended direction there is no suitable explanation immediately available.

Whereas the father is one of the important influences for the young women, he is an even more important influence for the young men. School influences are quite important in a number of ways for both sexes but the nature of the influences is sometimes different. Young women may be more greatly influenced by inner factors; young men by outer.

The question of sex differences in nurturance is professedly an open one. In this study of beginning senior year secondary school students, twenty-six percent of the young women vs. one percent of the young men spontaneously expressed their intention of working with children, a substantial difference in favor of the young women.

XII. ETHNIC SUBGROUPS: ASIAN AND CAUCASIAN

The Student Questionnaire request for "Ethnic background as you identify yourself" yielded the following distribution for the young women:

American Indian/Native American	3
Black	8
Caucasian	380
Chicano or Latino	6
Chinese	72
Filipino	3
Japanese	23
Polynesian	5

In the case of mixed ancestry the assignment was made to the father's ethnicity on the presumption that his was the dominant culture, as is ordinarily the method of resolution for the purpose of developing major groups.

Despite efforts to have minority groups strongly represented in the group studied (See Selection of Schools) very few blacks or chicanos were obtained in this sample. However, there was a substantial representation of Asians and it was therefore possible to make comparisons. For this purpose the Chinese, Filipinos and Japanese were combined, yielding an N of ninety-seven, to compare with an N of 380 for Caucasians alone.

It is rather remarkable in itself, in view of the proportion of Asians in the population in these six Bay Area Counties (San Francisco County is highest with thirteen percent), that so large a number is present in this sample. This is, of course, partly due to the intellectual industriousness which resulted in so high a proportion, forty percent, from San Francisco's Lowell High School carrying the requirement of a 3.75 grade point average for enrollment.

Since Chinese-American and Japanese-American students are known to be quantitatively competent and science oriented, a unique opportunity existed to compare influences and attitudes in the two groups.

Ravenna Helson, in a paper presented to the National Research Council in 1974 (20) says, "studies of the background of scientists support that certain cultural patterns favor the development of scientific interest and achievement. Oriental-American women may be a promising group, and study of their career styles and problems should help in the counseling of prospective scientists among them."

In the now considered classic studies of Chinese-American and Japanese-American students at the University of California, Sue and Kirk (36,37) found that Chinese-American freshman students in 1966 scored higher quantitatively and lower verbally in mean scholastic ability scores than the other students. The Chinese-Americans were more interested in physical science, applied technical fields and business and less in social sciences, aesthetic - cultural and verbal - linguistic vocations; were more conforming, less socially extroverted and preferred concrete-tangible approaches. Generally, Chinese-American females resembled the males, except that they were more oriented toward domestic occupations than the non-Asian females. Also, they were more interested in the technical applied fields of biological and physical sciences and business type activities than their non-Asian counterparts.

The Japanese-American students differ from the non-Asian students in the same direction as the Chinese but occupy an intermediate position. The Japanese-American females did not differ significantly from their controls in the domestically associated occupations, unlike the Chinese-American females.

In the present study the Asian and Caucasian young women were compared for those selected characteristics considered most likely to yield differences in science-boundness. In reporting comparisons only those which show differences will be noted.

As expected, the PSAT Verbal score mean of the Asian young women was lower, the difference being statistically significant at the .001 level. There was no difference in the quantitative mean although even the restricted range utilized for obtaining the samples would not have precluded it. The high quantitative scores of the Asian young women indicates their intellectual capacity, and the lower verbal scores are attributable to bilingualism and cultural differences in communication.

Differences in science-boundness are in keeping with these distinctions, especially since occupational levels were not taken account of in this composite criterion but only occupational direction. With more applied activity less high levels of verbal ability are sufficient.

SCIENCE-BOUNDNESS (BY PERCENT)

Group	Caucasian (N=380)	Asian (N=97)
1. Science	18.9	25.8
2. Science-Math	10.8	15.5
3. Math	4.7	4.1
4. Non-Science-Bound	62.5	54.6

At this stage of development more Asian young women (forty-one percent) than Caucasian (thirty percent) with equal aptitude are intending direction toward some kind of science.

The birth order distribution is roughly equivalent, with the exception of the fact that more of the Asians (seven percent to five percent) are only children, and more come from large families - eight percent are the fifth or younger children compared with three percent of the Caucasians.

As would be expected, there are real differences in the acceptances of mathematics.

EXTENT OF INTEREST IN MATHEMATICS (BY PERCENT OF GROUP CHECKING EACH OPTION)

	Caucasian			Asian		
	Checked	Highest Checked		Checked	Highest Checked	
Not interested in mathematics	26.1	25.3		9.3	8.2	
About as interested as in other courses	33.4	24.7		43.3	34.0	
More interested than in most other courses	27.7	8.2		24.7	6.2	
Plan to take more	33.9	19.5	41.9	38.1	24.7	51.5
Plan to take enough more to use as tool or constitute a major	22.9	22.4		26.8	26.8	

The most striking difference is in the degree of disinterest expressed which is relatively minimal for the Asians. Fewer of the Asian young women are indeed disinterested in math, more are neutral and considerably more profess the intention of continuing with it.

For science, comparative reactions are:

EXTENT OF INTEREST IN SCIENCE (BY PERCENT OF GROUP CHECKING EACH OPTION)

	Caucasian		Asian	
	Checked	Highest Checked	Checked	Highest Checked
Not interested in science	7.9	7.9	7.2	7.2
About as interested as in all or most of courses	26.6	24.3	39.9	26.8
More interested than in most of courses	37.6	11.6	32.0	4.1
Plan to take more	42.6	19.5	36.1	10.3
Plan to qualify for occupation in science, or major	36.6	36.7	50.5	51.5

The sharpest difference occurs in the category of seriousness of intent to prepare for a future in science, with over half of the Asian young women so declaring as against over one-third of the qualified Caucasian young women.

The following table shows the distribution of responses to influences or encouragement towards science. The question and replies, in percentage form, were:

"Please indicate the extent to which the following increased or encouraged your interest in the field of science by checking under the appropriate heading opposite each item."

FACTORS ENCOURAGING INTEREST IN SCIENCE (BY PERCENT)

	Not At All		Moderately		Very Much	
	Caucasian	Asian	Caucasian	Asian	Caucasian	Asian
Activities	23.4	30.0	42.2	51.7	34.4	18.3
Books and pamphlets about occupations	50.6	29.0	33.7	43.5	15.7	27.4
Counselors	69.0	51.6	23.1	41.9	7.8	6.5
Courses	5.0	6.5	28.7	33.9	66.3	59.7
Father	46.5	41.9	35.8	45.2	17.7	12.9
Financial considerations	73.3	59.0	19.6	29.5	7.1	11.5
Grades	17.9	19.4	50.6	38.7	31.5	41.9
Knowing someone in the occupation	44.3	45.2	25.1	24.2	30.6	30.6
Mother	55.1	51.6	32.7	37.1	12.2	11.3
Movie or TV program	73.7	72.6	19.6	17.7	6.7	9.7
Own abilities	4.7	4.8	41.2	43.5	54.1	51.6
Own interests	3.1	1.6	13.9	14.3	83.0	84.1
Own work experience	55.3	43.5	22.0	35.5	22.7	21.0
Peers	68.9	51.6	24.8	40.3	6.3	8.1
Physical capacity	57.6	54.8	27.1	33.9	15.3	11.3
Relatives and older friends	60.0	59.7	25.9	27.4	14.1	12.9
Teachers	27.9	30.6	39.8	48.4	32.2	21.0

Notable is a tendency for the Asian young women to indicate centricity rather than either extreme. This appears to be true to at least some degree throughout these comparisons and can perhaps be linked to the earlier finding that Asian young women tend to be conforming.

Activities in the young women's perception have more influence on the Caucasian young women, as to some extent do courses. In more cases the father is very influential and so are the teachers. Asian young women are more influenced than Caucasian by reading about occupations and by financial considerations. More Asians have been moderately influenced by counselors and by their own work experience.

In regard to decreased or discouraged interest in science, the results were:

FACTORS DISCOURAGING INTEREST IN SCIENCE (BY PERCENT)

	Not At All		Moderately		Very Much	
	Caucasian	Asian	Caucasian	Asian	Caucasian	Asian
Activities	65.8	81.3	25.2	15.6	7.2	3.1
Books and pamphlets about occupations	87.4	87.5	9.0	6.3	1.8	6.3
Counselors	93.6	90.6	3.6	9.4	0.9	0
Courses	26.1	40.6	36.5	46.9	35.7	12.5
Father	91.9	96.9	5.4	3.4	0.9	0
Financial considerations	94.6	93.8	1.8	6.3	1.8	0
Grades	45.1	53.1	32.7	34.4	20.4	12.5
Knowing someone in the occupation	90.0	96.9	8.2	3.1	1.8	0
Mother	91.9	96.9	6.3	3.1	1.8	0
Movie or TV program	92.8	90.6	4.5	9.4	0.7	0
Own abilities	28.3	40.6	38.9	34.4	31.0	25.0
Own interests	7.9	21.9	31.6	37.5	58.8	40.6
Own work experience	81.8	75.0	10.0	25.0	6.4	0
Peers	82.9	87.1	13.5	9.7	1.8	3.2
Physical capacity	80.2	84.4	15.3	9.7	1.8	3.2
Relatives and older friends	93.7	96.9	4.5	3.1	1.8	0
Teachers	66.1	64.5	19.6	32.3	12.5	3.2

The Asian young women have been less often discouraged by courses, grades, their own interests, their own work experience and teachers. Caucasian young women are more often very much discouraged by their own interests and abilities, by their courses, their activities and their grades. There seems to be differential perception of themselves in the two ethnic groups in relation to science.

In the responses to the open-ended question regarding experiences encouraging to science, the Caucasian young women more often indicate family influence, their own interest, science being a means to an end such as a good career, money, etc., while the Asian young women more often mention curiosity, liking for life science and external events such as reading, demonstrations, movies, etc.

The relationship by these encouraging experiences to being a young woman are stated as follows (by percent):

	Caucasian	Asian
Not at all	9.9	10.0
Not much	25.0	20.0
Some	6.8	2.5
Much	20.3	17.5
Statement of kind, with no degree specified	24.0	20.0

Experiences which have discouraged are enumerated with the following differences: The Caucasian young women more often mention their dislike of math, their lack of interest in math (sixteen percent to eight percent), their difficulty with math and science. The Asian young women more often comment on their lack of success in math and science; they feel that math is not practically usable and is too competitive a field.

"To what extent were these discouraging factors related to being a girl?" (by percent):

	Caucasian		Asian	
Not at all	18.8	39.6	20.0	66.7
Not much	20.8		46.7	
Some	13.9		6.7	
Much	13.9		20.0	
No degree stated	5.0		6.7	

More Asian young women feel that their sex is not a factor but proportionally more feel that it is a considerable factor.

Both the father's and mother's aims for the daughter reflect cultural differences in that the parents' aims are more frequently acknowledged for Asians.

Attitudes toward marriage and employment are very similar with the exception that twenty-three percent of Caucasian young women say they don't know about future plans compared with thirty-one percent of Asians. Of the projected occupations twenty-eight percent of Caucasians to twenty-one percent of Asians designate work with children.

REACTIONS TO PSAT SCORES (BY PERCENT)

	Math		Verbal	
	Caucasian	Asian	Caucasian	Asian
Higher than expected	18.6	12.5	14.6	14.6
About as expected	49.5	55.2	51.9	55.2
Lower than expected	31.9	32.3	33.5	30.2

ESTIMATES OF ABILITY (BY PERCENT)

	Math		Verbal	
	Caucasian	Asian	Caucasian	Asian
Very Superior	4.3	4.2	8.8	2.1
Superior	59.0	38.5	43.6	18.6
Average	35.9	54.2	43.6	60.8
Below Average	.8	3.1	4.0	18.6

Actual mean scores, it is to be remembered, do not differ for the Math scale but do for the Verbal scale in favor of the Caucasians, but by only five points. It would appear that the Asian young women underestimate themselves to a greater degree than do the Caucasians since all of the young women in this study are very superior on these measures.

REACTIONS TO GRADES (BY PERCENT)

	Caucasian	Asian
Well satisfied	27.4	11.3
Satisfied	46.6	50.5
Not satisfied	26.1	36.1

The reasons for lack of satisfaction which show marked differences are (by percent of those not satisfied):

	Caucasian	Asian
Do not work hard enough	62.0	37.0
Competition reduces grades	11.9	37.1

PARENTS' REACTIONS TO GRADES (BY PERCENT)

	Father		Mother	
	Caucasian	Asian	Caucasian	Asian
Well satisfied	46.5	22.3	48.8	22.9
Satisfied	43.2	58.5	40.5	62.5
Not satisfied	9.5	14.9	10.1	12.5

Again cultural values appear since grades themselves do not significantly differ.

The highest level of education to which the young women aspire is notably similar but there are differences in the type of college planned which reflect financial considerations. Of the Caucasian young women, nineteen percent expect to attend private institutions compared with nine percent of the Asians.

Of some relevance may be the parents' education:

HIGHEST LEVEL OF PARENTAL EDUCATIONAL ATTAINMENT (BY PERCENT)

	Father		Mother	
	Caucasian	Asian	Caucasian	Asian
Grade school or some high school	3.7	12.4	2.9	12.4
High school graduation	9.2	12.4	14.2	22.7
Vocational training (as trade or business school)	1.3	6.2	6.8	9.3
Some four year college or some junior college	10.3	10.3	15.8	6.2
Junior or community college graduation	3.4	5.2	4.5	5.2
Four year college graduation	25.0	8.2	25.8	6.2
Some graduate or professional school	6.3	4.1	8.9	5.2
Higher graduate degree:				
Masters (as M.S., M.A.)	14.5	4.1	14.7	3.1
Doctorate (Ph.D., D.Sc.)	7.4	3.1	1.3	0
Professional (as Medicine, Law)	14.7	4.1	7.1	1.0
Educated in foreign country	1.6	14.4	2.1	20.6
Don't know	2.1	15.5	1.3	7.2

It is clear that both parents' education level is lower generally for the Asians than for the Caucasians. Correlatively, more of the Asian parents are foreign educated which results most likely in the children being less knowledgable of the parents' educational attainment. However, all highest educational levels are represented among the parents of the Asian young women, even if to a lesser extent.

Present choices of individual college major do not yield startling differences and the N's are too small in any one category for fruitful comparisons. However, a few samples which show differentiation are (in percentage form):

	Caucasian	Asian
Pre-Med., Total	5.0	11.4
Decided	1.3	5.2
Undecided: 1st choice	3.7	6.2
Psychology, Total	8.2	3.1
Decided	4.2	2.1
Undecided: 1st choice	4.2	1.0
Math, Stat., Total	4.8	6.2
Decided	1.6	4.1
Undecided: 1st choice	3.2	2.1
Languages, Modern, Total	6.0	3.1
Decided	3.4	1.0
Undecided: 1st choice	2.6	2.1
Similarly for Intended Careers:		
Veterinarian, Total	2.9	1.0
Decided	2.6	1.0
Undecided: 1st choice	.3	0
Pharmacist, Total	.3	3.1
Decided	0	3.1
Undecided: 1st choice	.3	0
Physician, Total	6.4	10.3
Decided	6.1	10.3
Undecided: 1st choice	.3	0
Nurse, Total	3.1	5.1
Decided	2.6	4.1
Undecided: 1st choice	.5	1.0

The questionnaire itself (like reading and occupational information!) had a somewhat differential impact:

"Has the questionnaire affected your thinking about educational and career planning?" Responses by percent were:

	Caucasian	Asian
Yes	23.9	27.4
No	75.6	72.6

If Yes, in what way?

	Caucasian	Asian
Focussed thoughts	44.1	42.3
Caused to recognize not occupationally informed	5.4	0
Caused to recognize ways of getting Career Information	2.2	11.5
Reaffirmed or intensified own knowledge	12.9	3.8
Being chosen for study opened interest in science	2.2	11.5
Caused to question present choice of science	5.4	0

SUMMARY

Using a standard method of sample selection the only ethnic groups found which were large enough for comparison proved to be the Caucasian and Asian groups. Distinct differences appeared which were in accord with previous research findings. The Asian young women's Verbal PSAT scores were lower and a higher proportion were science-bound, though not math-bound. The Asian young women expressed less disinterest in math, and greater interest of continuance in the study of mathematics. Over half of the Asian young women declared their intent to prepare for a future in science, while only slightly over one-third of the Caucasian young women did so.

The Asian young women generally tend not to commit themselves to statements worded as extremes. However, they do appear to feel they are influenced to a greater degree in their choices by their fathers, teachers, reading about occupations, financial considerations and by grades than their Caucasian counterparts do, and less by their activities and courses. To a somewhat greater extent discouragement have come from financial considerations, counselors, movies or TV programs, their own work experience and teachers. They more often mention curiosity, liking for life sciences and external events such as reading, demonstrations, movies, etc.

These young Asian women are less often discouraged by their own interests, their courses, grades and their work experience. They more often comment on their lack of success in math or science rather than their liking, interest or difficulty, and say that math is not practically useful or is too competitive a field.

The Asian young women's parents have, on the whole, less education than the Caucasian, and are more frequently acknowledged to be aiming high for them. The Asian young women underestimate themselves to a greater degree than do the Caucasians and tend to attribute lack of satisfaction with grades to competition. Their fathers particularly are more apt to be dissatisfied with their grades.

Aspirations are similar and the chief difference in plans, other than that more Asian young women are science-bound, is that fewer of them intend to attend private colleges.

XIII. THE INTERVIEWS

In order to supplement the Student Questionnaire and obtain a first-hand clinical appraisal of the influences which encourage or discourage competent young women in relation to science, technology and mathematics, interviews were conducted with five percent of the young women participating in the study.

In planning the twenty-five interviews, a central question arose as to how to choose the young women. It was decided to select those who appeared to be fully decided upon their future direction and most serious about seeking it. High level academic and/or professional aspirations were considered of probably greater validity and permanence than technical semi-professional. Thus, theoretical designates were preferred over applied.

It was also considered desirable to include a range of occupations and, rather than insist on proportional representation, to encompass those occupations less or least commonly preferred both broadly and with groups. Subject to the latter condition, it was endeavored to select both science and non-science-bound students. And further, to select from among those oriented to science, science-math and math, those aspiring to occupations falling into the first two-digit groups of the occupational code structure:

-Scientists - Plants, Animals and Related Life Sciences

-Scientists and Practitioners - Human, Medical and Related Life Sciences

-Scientists - Physical Sciences

-Engineers and Architects

-Mathematics, Statistics and Computer Science

From Group 4 (non-science) selection was for stated objectives in the humanities. It should be remembered that despite top-flight quantitative PSAT scores this group gave no expressed consideration to the mathematics-science direction and indeed manifested disinterest/dislike of math, and secondarily, science.

An effort was also made to secure ethnic subgroup representation, especially Asian, known to be the study's major subpopulation.

To locate individuals, each of the young women's questionnaires was reviewed, and preliminary lists developed. For purposes of diversity, concentration and economy of travel, three schools were chosen: Berkeley High School in Alameda County; Lowell High School in San Francisco County; and Homestead High School in Santa Clara County. The lists were submitted to the schools, with enough latitude in numbers to allow for attrition. This occurred because of early graduation (not a deterrent in Berkeley, where interviews with graduated students were arranged on an individual basis outside of the school), absence on the date set or class examination conflict. The schools arranged the interviews and provided space.

Of the final twenty-seven interviews, eighteen were conducted by the Project Director and nine by an experienced psychologist very familiar with this age group and with the objectives of the study.

The distribution of interviewees was as follows:

School	
Berkeley	10
Lowell	10
Homestead	7
Total	27

Career Target By Occupational Classification	
Scientists: Animals, Plants	8
Scientists & Practitioners, Human	7
Scientists: Physical Sciences	3
Engineers & Architects	3
Math, Statistics & Computer Science	3
Other	3
Total	27

Ethnic Background	
Native American	1
Caucasian	19
Chinese	5
Filipino	1
Japanese	1
Total	27

Science & Non-Science Bound		
Code Group:	1.	9
	2.	11
	3.	4
	4.	3
	Total	27

The interviews lasting an hour on average covered science-mathematics-technology inclinations in the family and among relatives, the young woman's experiences in science and in math, the origin and development of her interests, her college and subsequent plans, and her experiences with counselors, printed materials and other sources in formulating these plans or making her knowledgeable concerning them. With only a single exception, those interviewed were responsive and thorougly cooperative, searching for answers to questions they had not for the most part really put their attention on previously. The interviewers also noted the young women's appearance, manner, maturity and femininity.

Narrative summaries of the interviews follow, each identified by number. To safeguard confidentiality, data such as name of company employing father were deleted.

Overall Impressions from the Interviews

Some impressions emerge clearly from these data which are more intensive and elaborate than the questionnaire data. Striking is the uniqueness and individuality of each young woman. The fundamental psychological tenet of individual differences is amply confirmed.

The significance of parental interests is again borne out - positively or negatively, for good or for bad. Sometimes there is the impression that the set may be counter to the young woman's own natural basic interests. Between the two parents, the father is apt to be the stronger influence. Older siblings, especially males, can contribute. Overwhelming is the feeling, again a confirmation of other scientific and clinical findings, that for these scholastically gifted young women the senior year in high school is too early for reaching firm vocational decisions or for these decisions to have become stabilized. Within this group, chosen for the definiteness of their occupational choice, there are only two whom the interviewers would be surprised not to see change. The vast majority is keeping its options open to a greater or lesser degree. The expectation is that later experiences will continue forming their choices.

Reaffirmed is the precept that science and mathematics do not function as a highly correlated combination of interests, but are independent, with mathematics more commonly the less attractive to the young women.

In addition to family influences, a number of others have affected these young women so far. Many of them come under the heading of accident.

The cultural and industrial resources of the area are important. In Berkeley, the proximity of the University and its rich intellectual and cultural life; in San Francisco, the opportunities of a diversified metropolitan center; and in Sunnyvale-Cupertino, the more rural, but still heavily industrialized setting, all have special and different contributions. Young women of this group appear quite resourceful in utilizing their opportunities for experiential exposure related to their interests.

There are a number of aspects of the educational experience which appear to be of positive or negative significance in the process of orientation to science and math.

Curriculum emerges as a factor of greater importance than has been generally assumed. Three aspects may be mentioned: (a) continuity, (b) content, (c) method.

(a) Continuity A common pattern for science is that there is no regular formal teaching until the seventh or eighth grade. Consequently there is little if any familiarization with concepts or facts, particularly during the periods of most active mental growth. Under these circumstances, when the first formal course comes in the seventh or eighth grade, the strain is heavy. Though called General Science, its emphasis and mix may vary widely depending upon the competencies and interests of the teacher. Early and consistent exposure to all sciences appears to be a practice which might well be investigated and experimented with. For young women particularly, a consequence of too late an introduction to the sciences may lead to a building up of a picture of their awesome, formidable nature which may never be overcome.

(b) Content Already mentioned has been exposure to a diversity of sciences, as well as to both facts and concepts, since different temperaments may incline to more specific or more theoretical aspects. In addition, there is a strong positive response to relating and applying scientific knowledge and principles to "real" life, living, and the environment.

(c) Method of approach in implementing curriculum makes a difference. High ability young women do not respond well to rote, routine learning. The preference is for concepts, and especially the discovery of them in the active process of doing, rather than in working problems for accuracy.

Teaching and teachers, as is no surprise, make a considerable difference, especially at critical points. One such point is the first course in algebra. If the student fails to grasp the concepts, and the teacher is unaware or not vigilant in making sure that sufficient learning is integrated, this can be the end of the road for either or both enjoyment and success. Generally, it is difficult, though not impossible, for these young women to be affiliated with the substance if the teaching in math or science is poor or indifferent, but it sometimes causes the young woman to take more responsibility. Good teaching is indeed a stimulant and sustainer, but gaps endanger effective continuity. Educational systems need to give care to providing full wherewithal to learning for high potential students. It was noteworthy in the interviews how much good teaching was recognized and appreciated in the three school systems from which the interviewees were drawn.

As expected by their calibre, the young women were generally very active and greatly involved in many expressions of other interests than their intended career direction. In the latter respect, they frequently do not have a good fund of information about what achieving their present indicated objective entails. They have not had much help, leastwise systematic help, in relating their preferences and strengths to career choices or in determining which college and courses are requisite to their objectives. The reflection in this case is on counseling or career guidance.

SUMMARIES OF INDIVIDUAL INTERVIEWS

Note: In the summaries that follow, the young women's own words are reproduced wherever possible.

INTERVIEW 021

She is an attractive young woman who was pretty much thrown by her mother's death from cancer less than three years ago. After that the remaining family moved from the other side of the tunnel to Berkeley, so she only recently came to this school system.

Neither parent was at all scientifically inclined. Her stepfather, a dentist, has not been an influence and her natural father only obliquely so. Beside a cousin who has worked in science, her father's brother is a Nuclear Chemist with the University, whom her father considered to be the brain of the two. She feels he is the image of a scientist; he works night and day and is buried in his work which is beyond her comprehension. His wife, whom she only got to know at all well after moving to Berkeley, is a Professor of Physiology and Science. She had heard of her successes and read her papers earlier, but now that she sees all she does she is inspired by her because of her success, both in her career and in holding the family together.

When she skipped a grade in elementary school, her father felt that she had a scientific mind and directed her that way, noting the way she thought things through and put things together. She thinks he was right. Earlier, before nursery school, at the age of two or three she was learning precociously, having evolved a method of self-teaching. She was sent to school early.

She hadn't been interested in science but rather in history and languages, until two years ago when she enjoyed her 10th grade biology a lot. She first loved the material finding it fascinating, and liked the teachers, too. She loved physics last summer finding it one of her best classes. She had not taken physics before.

Her nineteen year old sister, a Sophomore at UCB is into French and Dance, and beginning to like anthropology. Her twenty-one year old brother didn't graduate from high school and is making up at Junior College but is going into Chemistry at UCB.

She really enjoyed math but has not gone past second year algebra and doesn't know why not, probably because there were just so many good classes. She wished she had. She has loved all math, will take it in college, and is looking forward to it. Father helped her a bit with math but she didn't really get much help at home - went to the teacher.

The family is close, and while physically separated, will stay together. She feels she has matured greatly as a result of her mother's death when she was fifteen. When she moved to Berkeley she became aware of her capabilities and potential, having had in the back of her mind that she was not so good as others partly because of men and women's competition. She got 500's in the SAT and that was a real ego blow. But she has an active social life, a lot of friends, is an active person and does outdoor things. All her life she has accepted the idea that she would have a career but wants a family.

She can't settle on any particular field for her future, feels it is hard enough to settle on a university. She thought of the East as being different from Berkeley, Swarthmore, Sarah Lawrence, as well as all UC campuses. She is headed for UC San Diego, going there originally for oceanography having become very excited about scuba diving. Since then she has had second thoughts.

She wants to start in biological and support sciences and math and see where it takes her. She has liked her science labs and really wants to do research. She wants to be a discoverer of new things, and working for a university doesn't appeal to her much. She plans graduate work, possibly as far as a Ph.D. If she majors in something broad she can go on either in biology or physics. So far she has had straight A's in science.

Career opportunities are poor right now and flooded in such fields as oceanography which she had considered. She has not talked with a counselor nor used the Career Center.

She graduated early because so many things in her life were indefinite. She is on her way to Europe for three months and may want a year in Spain during college. Sometime she wants to spend a summar session at Harvard.

INTERVIEW 024

She wears glasses, plainish, long hair, grimaces continuously, mostly making negative faces, is uncomfortable and uneasy. Somewhat defensive, she finds it difficult but tries to communicate, staccato-like. She is non-psychologically oriented. She has strong hostilities. She is independent but not non-conforming. Her major goal is to move out of the house although family relations are not intolerable despite a very poor relationship with an older sister. She is not planning to go to college for two years if ever. She wants to obtain a job working with animals if possible and has already started looking. She would like to live in her home town in a large house with others and later move farther from home.

She has always loved animals and plants and has had every pet in the book except a canary, and has had and now has a horse. Why animal life in water rather than on land? She likes water, too, and this is a way of putting them together. She has a couple of friends, particularly one older boy preparing for that direction, so she happens to know about it. She has an uncle by marriage who was in charge of the hummingbird cage in a zoo.

Her father doesn't talk about what he does - there is poor communication generally. He does help the girls with math homework. During elementary school, in the 3rd and 4th grades, she was taught to count on her fingers. This put father against her and her teacher. At one point her father told her that she was stupid especially in comparison with her older sister (now heading for studies in Nutrition at UC Davis) and this turned her off math for good. Her father is nervous and excitable, was in charge of electronic equipment at a major laboratory until he quit and opened a bicycle shop. Later he became bored and returned to work at the laboratory.

Her least good grades are in Math and Science. She took neither in her senior year, indulging competing interests such as general culture, art (painting and drawing) and writing poetry. She doesn't want to start college until she has an idea of where she's heading and a purpose. She feels that science is something in the future. She had no math or science in her senior year; no chemistry or physics at all. Biology wasn't what she expected; she wasn't interested in cells and amino acids. If she needs math in the future she will take it.

She can't stand her counselor. Her sister's old one in the 9th grade was "ten times as good" and she has consulted him at times. She doesn't like the head counselor and wouldn't go to him either. She never heard of vocational counseling and is only slightly more familiar with career guidance. She never heard of the Career Center. She has been hunting for a volunteer or part-time job with animals, hopefully to work into something when she graduates. She doesn't know what field it is she's interested in, or how much or what kind of education she would need.

Her teachers have been good on the whole and helpful. She really liked a female Biology teacher (sex not important). She has liked teachers on the whole and speaks well of the educational system in her community.

She is taking a class at the California College of Arts and Crafts and will see what comes of it.

She plans to stay our of college awhile because her plans are not yet firm. She doesn't like math, and science depends on experience. Partially, she is tired of school, although she is enjoying this year with no solids. She claims she has friends; interviewer does not believe she has a boy friend. She does not have a strong people orientation.

INTERVIEW 026

She wears glasses and braces, is a pleasant, positively oriented young woman with rather stringy hair. She doesn't date or have any boy friends, but a few close girl friends. She talks pretty freely and is not bothered by the interviewer's colleague observing during the interview.

She is planning to try for Veterinary School at UC Davis, recognizes that she is embarking on a ten year program. Money is not so available; parents are divorced. Father was in Computer Science, lived and breathed it, was considered slightly on the genius level, became a systems manager at a paper plant, got tired of it and is now a self-employed carpenter. Mother, with an M.A. in English, had the top or second highest score in a midwestern state in her examination for English Teaching, is now a secretary.

She is planning to go to UC Berkeley next fall and major in bioengineering. She has a friend in college this year who thinks it is a good pre-med major and has given her a booklet about it.

Although she got such a high score in Math on the PSAT that she got a letter of commendation, she doesn't get Math as easily - got a B-, and has to work at it. But science comes just like that. She was pretty good up to Algebra II but couldn't get Geometry, doesn't think along abstract lines, is better at more exact things. She has taken Math and Science every possible time, liking Biological Science best, does best at it, has most aptitude for it - Physical Sciences require more math. She knows (on question) that Bioengineering requires Biochemistry and Physics and Chemistry and Biophysics, College Algebra, Calculus and several math courses.

Why veterinary science? She has always been really interested in animals, gets along with them, it's a feeling she guesses. She was born and grew up on a forty acre farm in rural Illinois where there were a dozen cats, dogs, two ponies and a bunch of cattle. They moved around a lot, to her present home, her fourth state only four years ago.

She has a brother one year older who hasn't made up his mind among Math, Chemistry, Physics. He excels in Physical Science, is now at a Junior College headed for UC Berkeley. Her younger sister is the smartest of the three, gets straight A's, is accelerated in Math. She herself has least Math aptitude of the three - a major factor in her affiliation with Biological Science is to be distinctive and have her own thing in light of sibling competition. She has felt the need to prove that she is as good as they. She is now enrolled in Math Analysis II through inadvertent misfortune. She should be in I. This is over her head and she is struggling.

She gets help from her friend's mother and from another friend. When her father was home in the family, earlier, when she was starting Math and thereafter, her father helped her.

She has two cats now. The father of a friend of hers is a veterinarian and she talks a lot with him. Through a Science class, Human Anatomy and Physiology, she got to the Career Center where she looked for odd jobs. She was placed in the Workreaction program. She listens to guest speakers at the Career Center in science related fields. She has never talked to a counselor or patronized the Career Center. Her knowledge comes from friends (her mother also had a veterinarian over) and books.

She is thinking of research, in veterinary science or maybe gynecology.

Since the 8th grade her science teachers have been encouraging. She had poor Math teachers (especially a woman long in the schools), mediocre ones and a couple of good ones.

INTERVIEW 041

She is a small, very young-looking and behaving, rather pretty Japanese young woman who wears glasses. She is conforming, deferential and tends to put a good face on things.

Says she wanted to be an obstetrician or pediatrician because "my doctor is a woman and I talked to her a lot, and I am interested in children and childbirth." However, she has recently talked with grad students and pre med students and learned of the tough competition, how hard it is to get into med school and what poor chances there are, and she had second thoughts about it.

The family, close knit, has always taken vacations together, camping along the beaches or the coast, sometimes in the mountains. They frequently got Park Rangers to come and tell them about sea life. She has been exposed to a lot of oceanography. She really enjoys beaches. Also on Charter Day at the University she heard Jacques Cousteau speak. So for April she has signed up for an oceanography course at Dillon Beach.

What does she know about oceanography? What she would like to do is be a Marine Biologist, a researcher, do lab work, she likes working in the lab. She has applied to UC Berkeley, UC San Diego and UC Davis. She really wants to go to UC San Diego and major in Oceanography. She doesn't know whether there is such a major at Berkeley, but she does know there is a set up at Bodega Bay. She thinks the courses are a lot of sciences - Biology and Zoology and Earth Science.

How has she gotten information? She discussed medicine with her counselor who told her she probably had enough math and science in her background in high school. In Trig class once the teacher was concerned about their majors and sent them for the period to the Career Center, her only use of it. Also, she has met a lot of people in Math and Sciences, friends of the family, during the summer she worked at family camps. She talked with M.D.'s, college students, and then she also worked one summer under the Japanese Exchange Program in Hawaii. Important is her mother's encouragement: She tells her that oceanography would hold better changes for her, being a girl and a minority member. Both parents praise her very highly on her Math and Science.

She has been taking Science all through school but really started to enjoy it with Advanced Biology in the 10th grade and would like to continue as a Freshman in college. She took a Micro-Biology Seminar at the Lawrence Hall of Science at UCB in the 7th or 8th grade which she found out about through a girl friend who in a high potential program had played with computers there. She also heard a lecture on Chemistry by Pimentel. She always liked science, any science, except in the 7th grade. She has always had good teachers, especially in high school and the 6th grade. She is in AP Chemistry which accounts for the fact that her science grades are below other averages. She got a C her first semester, B later, and got a 3 on her AP Test. This was because her mother encouraged her to take it again, telling her it was good to have a background in these areas.

Her mother was significant in regard to math too, had always helped her in math after school. In the 4th or 5th grade her mother drilled her with flash cards daily after school: homework always had to be done before any playing. She kind of hated math then but after a while it became a big game and she got so she could beat her mother to it. Later, when she got into algebra which neither parent had had, she called friends on the phone to help her.

She has always liked math. It has come kind of easily, now easier than science, algebra was the hardest. As a result of a seventh grade test for math she was placed in pre-algebra a year ahead. Algebra in the 8th grade was difficult but she has had no trouble since. Now she is in AP Calculus. There are only twenty-two remaining in the class after a lot dropping out since fall, of whom six are girls. She now admits that she has not been doing too well and is a little depressed about it. A lot of her classmates are also taking a course at the Lawrence Hall of Science and she thinks she may enroll there or get a tutor. When the teacher lectures it is hard to follow. She was not happy with her Math Analysis Teacher last year and thinks if she had had that teacher in algebra she would have dropped math altogether, permanently. She now liked Biological Science, Math, Physical Science, in that order. Biology you can relate to the environment. In Chemistry it is a little difficult to think of molecules and moles but a lot of fun. The AP class kept her on her toes and she learned a lot.

Her sister, almost thirteen, does very well in school too. They both like school, have very good study habits. Her sister is taking math and science, gets high grades, is in Advanced Science, High Potential, in Junior High School. She occasionally, very seldom, comes to her older sister for help.

In the 4th, 5th and 6th grades she was interested in the Orchestra, played violin, now the piano, and the guitar for fun. In the summer she plays in Tennis Tournaments. This coming summer the family will go to Canada for three weeks. She will work for the rest of the summer and will probably go to UCB where she can live at home and cut down expenses which will be easier on her. The prospect is kind of scary with so big a campus.

On leaving, she says that the questionnaire she filled out for this project in the Fall made her think about herself. (She said "No Effect" at that time.)

INTERVIEW 054

She is a plain young woman, with a long thin face and long hair.

Father is an assistant vice-president of a major bank, and although he isn't using Math so much now, he was in the data processing department and used computers a lot. He enjoyed Math a lot and is very good at it and took a lot in school. He thought that out of five kids he would have one mathematician. It's a heartbreak to him that he hasn't. Her two older sisters are a 5th grade teacher and a placement interviewer who majored in Italian and her brother is in the Navy operating heavy equipment. The second sister is good in Math but isn't interested in it.

Part of her not liking Math is that she's not good at it. It irritates her. She doesn't catch on to it quickly at all. She was very good in elementary school and in junior high school. They put her in the accelerated program where she would have Algebra in the 8th grade, Geometry in the 9th and second year Algebra in the 10th, Math Analysis or Trigonometry in the 11th - designed to get you into calculus by the 12th grade. So in the second half of 7th grade she was placed in pre-Algebra to get her ready. She was doing fine before and it was a mistake to put her in the accelerated program. She got confused and it multiplied from there on. She can trace everything she can't do to that time. Her father helped her all the time but he got irritated and impatient when she needed a lot of explanation, didn't catch on the first time. Her mother was as bad as she - it's a family joke. Her teachers were all so busy, they helped her with specific problems only. She didn't realize she was getting that confused until later on. In Algebra 3 and 4 she started to realize what she didn't know - then it was too late to go back.

She has had very little experience with Science. She had the required course in the 7th grade, one year of real general Science about which she can't remember much. After that she didn't take any until the 11th grade. She signed up to take AP Chemistry but found that it was too hard, way over her head. She wanted to take her requirement that year so she took Physics. That was okay. Frankly, she hated the teacher. The course was interesting because it explained a lot about how things work and about the world. She was frustrated again by her lack of Math.

No one ever taught her to think logically in steps as is needed for Math and Science. She does well in languages. She liked to compare similarities and differences between her own language, English, and others she learned. She has had four years of German, a little Latin, and is now starting French. Languages are very easy.

Her SAT's are M 570, V 680+. Achievements, English 670, Math 570, German 700. She went down in Math since the PSATs. She doesn't know where she is going to college. She is hoping for Radcliffe but doesn't really expect to be admitted. She wants to go away from home. Besides, she has always been in a large co-educational school and would like to be in a small girls' school. She has applied to Mt. Holyoke as well as Georgetown, only because it has the only specific interpreter program. She has been admitted there but because of its less good academic standing she does not want to go. The University of California at Berkeley is her stopgap and if she goes there she will live at home for a while.

Her counselor helped her a little to find suitable colleges but she has never talked to anyone about her major. She didn't get any help; she made up her own mind. At one time she thought she would be an M.D. but she felt it was not for her and that she should concentrate on something she was good at. She has noted used the Career Center but went to hear a speaker who talked about the State Department. She found out that people are needed who are very good at the less popular languages. If she majors in German she would like to be an interpreter at the United Nations, and if in linguistics, would like to do research. Lately she has developed an interest in literature, having taken a really good course in the fall.

There is a project MESA at her high school (Math, Engineering, Science Achievement) which pays black and chicano students to get B's in Math, Science and English courses, any of them. They get $50 the first grading period, $75 the second, $75 the third, $400 a year. This makes her mad , because nobody is going to pay her anything even to maintain a straight A in all her subjects.

INTERVIEW 055

An exceptionally tall young woman, Chinese, rather outgoing, well adjusted, highly effective. In spite of a fantastically heavy schedule with a deep commitment to cello, and a heavy school load with full quotas of solids and straight A's, she has time for friends of both sexes.

She started with piano for a number of years, and with a summer program in elementary school, in the 4th grade she started cello. She played in school orchestra, by 9th grade was really into it and now is really serious. Parents told her not to waste time on it, but by now they are really proud of her. There is no music in her family nor Math or Science.

All her private teachers say she can do really well, make it professionally, at least has always been tops, good enough for an orchestra, perhaps a major one eventually. She really loves it, practices three hours a day (she studies for one and a half hours), and when the orchestras in which she plays require it, two to eight hours of a Sunday.

She is going to U.C.L.A. in the fall, partly to get away from home and partly because she wants a general education. She has already auditioned for a teacher on the faculty at U.S.C. who has accepted her. She does not intend to prepare to teach; she is much more interested in performing.

Her brother, five years older, a U.C. graduate, is a Research Scientist in Biochemistry. He is doing really well. He has always been good at Math and Science - "the opposite of me". She maintains grades in Math and Science because of the way she is, not because she likes them. The differences between them are not due to sex, it is just the way each is. She reads a lot, especially History and English.

She has taken a lot of Math, up to Trigonometry and Math Analysis I and II. She felt it was general knowledge and what everybody should have - a good background. She never disliked it but was never really thrilled. When she got into the higher levels it became more difficult. It didn't come as easily, she had trouble grasping it, she didn't spend as much time on it, didn't have as mathematical a mind.

She was asked about commonalities - Math and Music. She thinks Musicology and development of a theme could equate with Math - the technical aspects of writing music - but she is not interested in that.

About science - she probably became more interested in other things. She didn't start out with Advanced Biology in the 10th grade which impeded the possibility of going all the way through. In the 9th grade signing up for Science for the next year seemed formidable because she hadn't had any. English and History you are exposed to all the way along. She had Science in the 7th grade; it wasn't required in the 8th. If it had been required and she had become familiar and less fearful (had awful visions of Physical Science and Math when young) and more Math/Science oriented, she might have continued.

This semester she's taking all cultural courses which she is enjoying, and of course she loves her music. She has dropped the second semester of Chemistry.

She knows it is very difficult to get a job as a musician. The competition is almost as bad as going to medical school. You have to be determined from an early age, it has to be your whole life, because you are competing with people who have great talent. This she found out chiefly through a summer national program at a western music school where there were teachers from the best eastern music schools. She looked at them, talked with them.

She also learned from her private music teachers. She has never talked to a counselor - "a high school counselor wouldn't know - I know more than the counselors".

Regarding teachers - all her Math and Science teachers were really good - she finds no fault with them. Actually, her mind is very analytical, but not in that sense, because she isn't interested in Math and Science. She is used to having things come really easily, like music, and when she got into advanced Math and Science she had to work really hard and got frustrated and that could be a part of her distaste.

INTERVIEW 069

She is a plumpish, fairly pretty, acned young woman who is gentle, quiet, slow to respond, thoughtful, rather uncomfortable, although very active and relating well to peers. She had a boy friend all last year who is now in Physics at U.C.S.D. This year she has much more time, but people are becoming a priority for the first time.

She doesn't like Math especially, has a hard time seeing it use or application and has a bad feeling about it, but she knows it is necessary for Science. She started to have difficulty several years ago when she was overburdened with activities and too many classes. Math is difficult for her and she didn't spend enough time on it. Music and the tennis team had priority then. Arithmetic was fun and easy. In geometry she got behind; other things came in, and she got low B's. She is now in Math Analysis I, keeping up and trying. Physics and Chemistry are hard to understand. Last grading period she had trouble making Chemistry come together. She has had help in Math from her father, and also in Trigonometry. Her sister, who is now studying Nutrition at U.C. Davis, also helped her.

Her objective is to study Forestry; she attributes this to her school career center counselor and friends equally, especially a friend studying Forestry at the University of Utah. She might, however, eventually find English or History (most fields) satisfying(!) She has also been interested in natural resources and is turning to it in a broader way than Forestry alone. Ever since she was little she had back-packed and camped with the family and later with friends. The family never permitted littering and inculcated respect for the outdoors environment. Her mother gardens a lot (she lights up as she says so) and she has a vegetable garden.

She may be a technician (two years) or a professional (four years). She knows about working in timberland for a company or paper products, and that the government has the "biggest jobs". What does a forester do? "I'd really like to know." She knows it takes Physics and some Math - Calculus.

She is thinking of going to Humboldt next year and in spring vacation will go up and look at it. She wants to be sure they also have music - but for her spare time.

Counseling has been a big help. Working with the Science teachers, her Physics teachers took the whole class to the Career Center and put them in it. She perforce took a Kuder, was high on "outdoors", was given a list of jobs as a result of which she went to a lecture given there by a professor of Forestry. She was told it is a good field for women and minorities whom they are recruiting. Parents do not respond one way or the other.

She has always had good teachers in Science both in high school and junior high. Oceanography was very good - the teacher was interested in conservation and got her interested too. Math wasn't exciting. In Science in junior high school she went on field trips, had labs - that was all fun. Most of her friends are in Science. She doesn't think that influences her but rather has them because of interests in common.

Her brother in the 9th grade takes Math and does all right but doesn't care about grades as much as she. She has found a half-time job baby-sitting, having only a half day of school.

She is pretty sure about college but open to change in direction. She had more female than male teachers in Science which didn't seem strange. Only recently she has known that "women are different." She wasn't pressured either way and role models are of no importance to her.

She likes school, found last year tough but has been very lucky with good science teachers in the system.

INTERVIEW 071

She is a rather small, plump, outgoing young woman from a total science environment which appears to be her predominant influence. Not only are father and mother physicists but both brothers are at U.C. Berkeley. One has a chemistry major and is in pre med; the other is headed for chemistry. It is an all science family which talks a lot about it. The dinner table conversation is too technical for her and she could sleep through it because everyone is more advanced than she. The parents do not entertain the idea that there is anything to do in life but go into science. No one else in their background is in science except one cousin of her father's, nor is there anyone on either side of the family who had had even a college education. Mother started after the last child was in school and has worked ever since having formerly taught Physics and Computer Programming.

This young woman has had a struggle and the observer wonders whether she would be science-bound were it not for her environment. She has her best grades in Social Studies and has always enjoyed them. She is a school leader in governmental activities, reads political history for pleasure, but eliminated this field on the same basis she has eliminated many of the particular sciences of the rest of the family: she knows she does not wish to write or teach. Rather, she would like to do active research. She feels she is not cut out for law or politics - couldn't take the competition or the mental strain.

Math is not a favorite of hers and she is not especially brilliant at it. Last semester she got a B in Math Analysis I. She is taking Math Analysis II in order to make Calculus easier, which she will need for college Sciences. She chose Math over Physics this year because of her mother's advice that she would need it more. Math is okay when she catches on. She took Algebra IV for basic understanding as a stepping stone to all Math and got a C and retook it without credit for her personal knowledge. Algebra was her first block but she had a bad time in Geometry. Now she takes Math Pass/Fail.

She is planning a major in Geology because of her surroundings. She lives in the Bay Area, in California, where there are earthquakes, mountains, deserts, different parts of the earth. The family has been very outdoors oriented especially her father who took her along on many and extended family outings. Her mother who is more dominant has always been very active sportswise, in addition to her work. She herself wants to be out, not behind a desk, in the future.

She used to be in Biology, though Chemistry is her first preference among the sciences, and found both basically easy. She would have liked a more rigorous course in Biology and now there is an AP class, but too late for her. She was freaked out by the idea of the competition in pre med and Biology, and so Biology faded. She feels there is less competition for a girl in Geology and the Physicial Sciences; and Geology is a pressing field in terms of national interest and will grow.

How does she know about this field? Mostly because she is close to the University. The family gets university calendars of events and she goes to lectures on the campus and to scientific exhibits. The family has magazines floating around the house and she picks up the Scientific American, National Geographic, etc. Since the 10th grade where she did reports in History or Biology she has done them on geological subjects, regarding environmental oil, energy, earth related matters. She has had no occupational information at school, has never been to the Career Center. She may have told her counselor her plans but not discussed them. She did ask her counselor about colleges and was advised to explore them. She has disadvantages; her grades are not all that high. She went for 9th grade to a private school where the teaching was not all that good and grading was somewhat whimsical. She has had two very bad math teachers, although at her high school the science teachers especially have been good. Her SAT's are not all that good: English 430, Math 540. Achievement in the 500's in English, Math, Biology, and 670 in French.

Her mother's influence is strongly felt in decisions for applying to college. She feels mother is over-protective, disapproving of all her friends, and she wants to go away to college. Her mother got the College Handbook, she did see college representatives at school, and has applied to those schools she has a chance of being admitted to and which have Geology majors or preparation for such. She has been admitted to U.C. San Diego where she would have to transfer after two years, and to a Poly Tech Institute for which she would have to take Physics this summer. She doesn't want to go to school straight through but is thinking of a summer session at U.C. Berkeley. She has also applied to Pomona, her first choise, Wellesley, Barnard (her mother's college) and Mt. Holyoke, the strongest women's college. Wellesley's exchange program with MIT would enable her to take her major there.

She has many friends of both sexes, most of whom don't know what they want to do. Her best girl friend is going into business. Her boy friend is going to stay out a year before college but will probably take Math/Science. She has turned to them for help with her studies. She had always asked her father for help. He gets very upset if she doesn't get the point quickly and becomes impatient. Her mother has trouble figuring where she is and in explaining to her in her terms. So the main help has come from friends, sometimes teachers.

She is planning on graduate school.

INTERVIEW 072

She is a wonderful young woman, strong, sincere in her convictions, mature.

She doesn't have much background in either Math or Science. They were the subjects which least interested her, so she didn't rush to take them. She never enjoyed either one. There are branches of science she really likes. She really liked native plants, going out and looking at them. It isn't the kind of thing you can study specially. Those 7th grade science courses are very general, skip around a lot, are not very cohesive. The 7th grade teacher wasn't so good, the others have been. She took oceanography in high school, the one science course she really, really enjoyed. It was specific and dealt with something she is interested in - the outdoors. Physics was okay, she had a very good teacher. She does well enough in science, not out of particular enjoyment of the subject. She feels obligated to do as well as possible. She likes to do well at everything.

Like science, there were other things she liked so much more all along the line. She always did well enough in arithemetic and math until Trig, when she went downhill. She always got by but she was more interested in languages and literature and concentrated there. Languages attract her because she has a good ear for them and has always done well.

She took more math than she had to take, she doesn't know why actually, she thought she would need that much. She is glad she went that far. She is finding it useful now, she must say, on her job. She could have done without Trig which she couldn't understand anyway. Her math teachers kept telling her she was doing fine, just fine, when she asked for help because she didn't understand it. Her friends helped, and the math lab: she scratched through without knowing what she was doing. This was after first year algebra when she began to have problems. Her math teachers have not always been very good. The last three years they didn't teach clearly. Her second year algebra teacher didn't really know second year algebra and had to be corrected by students in the class.

Languages fascinate her. She would have taken more than her French, German and Latin if she had had time. She wants to be able to read the literature in the original language. She likes the languages themselves. She is really interested in grammar, which may sound strange, and technicalities like that.

Her father is the Art and Music Critic for a large metropolitan paper and is a composer. Both parents are interested in cooking, and she is, too. She has a lot of the same interests they do. She likes her parents. It is nice that the whole family has the same interests except her brother, fifteen, a throwback who is now interested in stagecraft and cars and motorcycles. Her sister, twelve, is like the rest of the family, sharing her own interests. She thinks this is rather unusual, she doesn't know many families who all like to do the same thing. She can't think of any relatives oriented to Math or Science. Her mother's father was originally an Electrical Engineer, but gave it up to run a ranch which he has done for years and has never talked about his original professions. Her fathers grandfather was a university level Physics Teacher, both in the U.S. and in China. Her mother grew up in the country and her father did, too.

She feels cramped in Berkeley, enjoyed the outdoors, enjoys nature, and wants to get away to the country. She has applied to Humboldt State, because it is in the country but she would be satisfied to go to Junior College for a year, and if so, would go to Santa Rosa. She wants the country and an easier pace. There is a lot of pressure at U.C. Berkeley and she wouldn't satisfy the entrance requirement not having enough science. Besides, it costs a lot more.

She had wanted to study in Europe, be somewhere where French was spoken, but she couldn't work out a program she could afford and hopes to go later as part of a college program. The college she is intending to start in will be for only one year, after which she will transfer to a strong linguistics Program. She is a National Merit finalist and has gotten a lot of mail. Programs which look good are Syracuse, Case Western Reserve and U.C. Berkeley. They are interesting enough to find out more about. She has the problem of deciding country vs. city. Her sister also hates the city and wants to go to U.C. Davis for animal husbandry. She wants a pig farm, likes pigs! For herself, she is going to have to find out which is more important - country vs. museums and opera houses.

She didn't apply earlier for a Merit Scholarship because she thought she would be in Europe, but will now. Her SAT's were M 700 V 760, Achievement Math Level 650, English 800, French 800. She comments that her Math has come down since the SAT but grudingly recognizes that the scores are quite good.

She graduated early because she was tired of the whole thing. She had enough credits. She thought she would get a job for the interval before Fall. She has worked almost a year for the Women's History Library. She also decided she would never again work for a non-profit organization because they are so badly organized. She did office work and interim librarianship. Because the people were dedicated feminists she started to feel hypocritical. She goes along with it to a point but not to its being one's whole life.

She went to the Career Center when she was looking for a job to do after school for money and when she graduated. They were not helpful and she found jobs herself. She is now working three days a week and wants another job to fill in. She is working at the family restaurant, a notable small French one, of which her parents are part owners and at which her mother cooks. The head bookkeeper needed help and was willing to train her. She has done it pretty gradually and it is not that complicated. She doesn't like math at all. But it is a useful skill, she is glad she went through with learning it, and it would be good to have if she is ever desparate.

She is not too much worried about her vocational future. There is not too much you can do with her interests and she would be willing to do something else temporarily. She doesn't know too much of what you can do and hasn't tried to find out. She hasn't felt ready or pressed to look into it. No, she hasn't talked to a counselor about this sort of thing.

She has always felt more sure of what her interests are than most of her friends and is pleased about it.

INTERVIEW 082

She is a small, compact, smiling young woman who seems young. She is a very good swimmer on the AAU team. The whole family is involved. Swimming takes a great deal of time, and self consciously she attributes her lack of social life to this time expenditure.

She used to like math a lot. The questionnaire she took for this study made her think about the subjects and the teacher. When she liked math she had really good teachers. This was in Burlingame in the 5th, 6th and 7th grades. She moved when she was in the 8th grade, and has never liked it as much, especially last year. The whole way math is taught is different. In her former school you had to discover for yourself as you were doing it. Here they just gave you the book and you had to work out the problems.

She kept taking math because it is needed if you wanted to go into science. Now she's just taking math because she has to. She enjoys it some. She didn't take it last term. The semester before last she had a terrible teacher. Now she has a good one. But she feels like she is missing something. She goes through it and does it automatically without understanding it completely. It's getting a little better. She has never felt she needed help nor has she gotten it. At first it didn't bother her but when she started thinking about it as a result of the questionnaire it began to bother her.

Science is just the opposite. Her teachers must have been really good or the subject interesting because she has really enjoyed it. She has taken it since the 7th grade. In the second half of the 8th grade she had a student teacher. The class was split in half and she had Chemistry and Physics. That was when she found she liked chemistry. In the 11th grade she took AP Chemistry. She got B's both semesters. It was a hard course, in which about half of the students were girls. Now she is taking physics, getting an A, though the first report period was a B because she went to Europe She can't really explain why she likes chemistry. She liked the atom. It is really interesting how you can find out so much about a substance just by how it's put together.

She is going to UC Berkeley and will live at home. She has been looking through the catalogue and the chemistry major seems too far removed from regular life. Biochemistry seems more related to life and to what people do, and she thinks that will be her major. It sounds more interesting because she likes biology, too. She doesn't know anytning about the field, would probably do research. She went to the Career Center once in the 10th grade when she was interested in Agriculture. She looked up Soil Science, other agricultural areas, and Chemistry too. There was a whole set of pamphlets. They didn't really give what she wanted. They weren't that interesting. She took a test there that said she should be a truck driver, do something outdoors. She has never talked to a counselor.

Her parents go along with her in spite of the fact that neither one has any special interests. Her mother's father was an engineer and was good with math. She sees him every couple of months but he doesn't talk about his field. There is no one else in the family even remotely related to her interests. Her sister in the 10th grade wants to be a psychologist or psychiatrist, and her 8th grade brother likes math.

She is quite clear that the only influence for her has been the courses she has taken.

INTERVIEW 231

She is a stocky, squat, squarish young woman who wears glasses and has a boyish hair cut. She has a decided masculine use of hands and body.

Of Italian background, the family, she says, is not science oriented. Her brother, eighteen, now at San Francisco City College started at Visalia Junior College on a baseball scholarship. The older brother, fourteen, has no leaning in this direction, but her fifteen year old sister is taking Biology and likes animals and pets.

She herself was influenced towards science by really good teachers in the 6th grade and especially in the 8th and 9th. Physiology and Chemistry she liked but didn't do well. She is not much on studying, is lazy, doesn't buckle down. She is an active person who always took part in games with her older brother and his friends and got good in sports. She coaches vollyball and basketball and is on the school basketball team. She likes sciences and if she studied she could learn a lot more. She dropped Physics - she liked it but wasn't doing well. She is taking aerospace science. She appeared shamefaced about her grades.

As for math, she had an 8th grade teacher who was absent a lot and consequently she had a poor foundation. She had trouble with algebra and didn't turn to anyone. Now she is helping her brothers and sister and is getting back some of what she had missed. She can set up a problem but not solve it. She started calculus last semester and quit. She is hoping to take a basic algebra course in college to give her a good background. She thinks the teaching she has had is overall pretty good with her share of good and bad.

She wants to be an Aeronautical Engineer, likes airplanes, wants to design and fly them. Her father is in the Army and lectures on Army Engineering, aeronautics and artillery. She likes to learn in this area, has picked up a great deal from him. He doesn't fly himself and picked up most of this himself in the last three or four years. She is close to her father.

What does she know of the field? She has read the basics of how planes function. She learns things, sees articles in magazines. In the Career Center she is looking into Air Force ROTC, they don't let women fly in the Air Force, but there is the Aerospace program. She wants to fly and design planes. Her 10th grade counselor discouraged her. The counselor wanted all women to be nurses and men to be doctors and lawyers. She didn't talk to a counselor again.

She does know Math and Physical Sciences are necessary and she is willing to try. She has applied to San Francisco City College and San Francisco State University. Her grades are not that good and she doesn't want to go away from home yet. Her first two years she will see how she does in her engineering courses hoping she can do well and then go on. San Francisco State University has an Engineering Major with an Aeronautics option -

Aeronautical Mechanical courses.

Her best grades are in Social Studies: Civics, U.S. History. She likes history but all it leads to is law or an M.D., and actually these courses were not foremost. Some of her friends are going these directions.

Her parents figure she knows what she wants to do and are glad she has chosen Aeronautical Engineering rather than be lying around doing nothing.

She watches a lot of TV. She has friends on the set of "The Streets of San Francisco" and helps with messages. She is thinking that if aeronautics doesn't work she may consider Hollywood for movies or TV. She was an extra in a movie last summer and she sort of has connections.

INTERVIEW 254

She is a smallish, slight young woman who wears glasses. She is intellectually sophisticated, mature, high powered, with a good sense of humor.

She had really wanted to become a physician. Ever since she can remember she has liked science. When she was about four years old she was collecting insects and rocks. Neither parent was so inclined. Her brother, now twenty-three, is interested in Chemistry and Physics; her sister, twenty-four, has no interest in science.

Her father is an Army Officer and much of her early education was in Europe. School originally did not reinforce science - they didn't teach little kids anything but hygiene in which she was not interested. But overseas she read a lot and learned on her own. In the 6th grade, in Turkey, the teacher didn't known much science and let her teach her class.

In Science, Physiology was fantastic, horribly basic, but interesting. She was an informal lab assistant and did a lot of section work. She has had a lot of Biology courses. Chemistry she despised because of the teachers but now she is in AP and it is fine. She is doing Physics in an independent study, has six text books and is doing all the problems. She likes it and likes going at her own pace.

Math is disgusting. She was always good at it until the 5th grade when a lot of bad things happened. She started fractions with a Hawaiian teacher whom she couldn't understand. This was in an Army school in Germany where she was beaten up everyday by an older girl. She did very badly in everything. But this affected arithmetic and math - thereafter it was easier to avoid. She can do it if she puts her mind to it but would rather not. The only math course she likes is Topology, she doesn't really understand it but is doing well. This also she is taking in independent study, doesn't have to compete with anyone, can do everything at her own erratic pace. When interested she managed to do math and does not see it as a problem, doesn't want to put the effort into it - would expend a great amount learning cranial nerves.

Her medical interest began at six when she had a toy medical kit. She was a hesitant, shy child, but everyone always said she should be a doctor. She got good grades and she had bad handwriting and a disgusting vocabulary.

She wanted a scientific program in the summer in research and when NSF didn't take her for the Bar Harbor program she joined the Allied Medical Program of the San Francisco School District. Every week she was rotated to a different site. With a good deal of handling of supervisors and pushing she got a number of special opportunities. She was allowed to do pharmacological Research in the Leprosy Research Unit of the Public Health Hospital.

Her father's brother is a Thoracic Surgeon and she had always been fascinated with surgery. Others were skeptical about her involvement but she wanted to prove everyone wrong. In August she wangled her way into Cardiac Surgery at Presbyterian Hospital and into scrubbing up for the chief operations. With surgery, she is impressed by the combination of precision and total awkwardness, that is what is really beautiful about it. In dissection or grafting, so small and delicate an activity takes such talent, like being a sculptor. She is good with her hands.

She has a tendency to go overboard, and then came Emergency Room work and now Orthopedics. She worked full time in the summer and now from 1:30 to 5:00 every day, and is functioning as a paramedic. She believes she is getting credit at Antioch College West but doesn't need it. She has AP Biology already, is planning to take three more AP tests and skip a year in college, being closer to med school.

Her father is retiring this year with considerably reduced income and back problems - her parents are moving to Florida. She will attend the University of South Florida because (1) it is cheaper (2) the climate is better - she has a bronchitis problem (3) the medical school is new and she thinks she can manage to get into some med school courses as well as the pre med as an undergraduate. From school she has gotten almost no help in planning for college. She has never talked to a counselor. They are too busy and don't know anything about medicine, only about Harvard and UC Berkeley. She didn't feel the need to talk with them, she knew basically from talking with people in the hospitals. She gave thought to the six year applied programs. She wants to go to a good medical school: U.C., Stanford, John Hopkins. The thing that makes her miserable is that she's never going to learn enough. She is compulsively active.

Her friends are a motley assortment. Her best friend's father is a paleontologist at UCB but she is not science oriented. Her boy friend is in the Medical Explorers and wants to go into medical law. She goes through boy friends rather quickly, would like to get married but doesn't think it's fair for career women to have kids. She doesn't like the idea of having a governess or putting a child in nursery school. If you have children you should spend time with them - it's not like having a pet.

Her parents smile indulgently about her intentions of an MD and Ph.D. but are pleased and proud. They wanted her brother to go into medicine. They say she will have to pay her way. Her mother intended to open a little shop in Florida with her father. That is for the future.

INTERVIEW 257

She is pretty, well dressed and groomed. She is quiet but not shy, quite poised, self assured, with considerable self insight.

Since she filled out the questionnaire her interests have become more focused from a general interest in math to a specific direction of computer science and electrical engineering. She has applied to the local university for admission into this major and if admitted will live on campus in a dorm. This narrowing of choice is partly reinforced by her current membership in the Boy Scouts Exploring Club in Data Processing where she is learning about the use of computers. She wants to be an engineer because she will get a job easily, it has to do with physics and math, both subjects she likes very much. She has checked out other kinds of engineering and likes electrical engineering best.

She is in an Advanced Placement math class, in calculus, and will get one year of college credit for this. She has always liked math because it is easy and she always does well in it. She did well in math in grade school but there was no special recognition by anyone of her ability in math although she was in a grade school high potential program. In 7th grade she was placed in an accelerated math class for honor students and this was the first time she realized that she was good in math.

She had her first contact with a science course when she took General Science in the 8th grade. The course emphasized biology and psychology but very little about physical sciences. She liked her teacher and for a short while was interested in psychiatry. In her 9th grade biology course her teacher was not good and she was not excited about what she learned. Following this she took physiology and most liked the study of bones and muscles and how they worked. She could picture this in her mind and it was easy to learn because it was a review of what she had already learned in General Science. Her chemistry teacher was very poor, so much so that she had to teach herself, and she did not like having to do this. However, she wanted to learn and wouldn't let a poor teacher discourage her. It just made it harder for her to learn what she wanted to. She is currently taking physics and especially likes learning about circuits. She is having difficulty understanding electrostatics. She doesn't understand the application of the principles in this. She knows she can learn anything best when she can see something in a tangible, real way. This is when she likes a subject best.

She had never thought of a goal of medicine or any health science fields although her father is a physician. Her family is full of doctors - her grandfather, uncles and several cousins are all doctors. She feels the biggest influences in helping her make her choice for a field are that she is good in math and what she learned from her own reading and information gathering about fields. Her mother helped her get occupational information by bringing home such material from another high school where her mother does volunteer work in an occupational information resource center. She would give her mother lists of things she wanted to find out about and her mother would supply the appropriate materials.

Her current math teacher has been urging her to be a math major in college and become a math teacher. Her mother thinks she has made a good choice for a career and is very supportive. Her father states openly that he does not like her choice, that he considers engineering a stagnant field where there is nothing new to be discovered. He wants her to be a doctor. She says his criticisms don't bother her because he really doesn't know very much about engineering and she knows she doesn't want to be a doctor.

Her brother is three years older than she is, is attending a local state college majoring in Theatrical Arts and is a comedian and actor in a local theater group. Her younger sister is attending this high school, is good in sciences and plans to become a Zoologist studying extinct animals. She has many friends, mostly boys, but she does not have or want a steady boy friend. Her friends are mostly interested in non-science areas and planning on Business Administration and Law. She is not at all sure she wants to get married but if she decides to, she would not consider it until she has finished her schooling.

She sees the Electrical Engineering and Computer Science Major as learning about the use of electricity, about guilding circuits, pacemakers and fixing computers.

INTERVIEW 261

She is a husky oriental young woman with a strikingly deep, loud voice. She is very poised, forceful and self-assertive. She is aggressive and outgoing, with interrelational skills which seem very conscious and predetermined.

She wants to go to medical school, and when she is a doctor would like to work in the emergency room of a large hospital in a large city. She feels this would be very challenging. She feels other medical specialties are not challenging, are too routine. The only specialty she might consider would be cardiology. Emergency room work would be exciting, have lots of pressure and lots more satisfactions because she would be helping someone who was in real danger and therefore her function as a doctor would be even more important. She will attend the local university, live at home and commute to school. She especially wants to go to this university because it is a good school, has a good math department and a great Chinese student population. For her undergraduate work she will major in physiology and minor in math.

When she was little she was impressed by the television program Star Trek, so that she was influenced toward medicine and also became interested in Astronomy. In grades 4 and 5 she read a lot of books on astronomy, on the origins of the universe and the structure of planets. She didn't have a telescope but would have liked one. She took general science in the 8th grade, then had one year each of physiology, biology, chemistry and physics. She always likes the theory in her courses because it's more challenging to learn. She has heard from friends that fields which are theoretical do not lead to jobs which are great. Until two years ago she thought of sciences as a kind of pastime even though she liked science. She was planning to be a math teacher. Then she took a physiology course and this teacher really impressed her. Also she was a teacher's aid at her high school and helped teach math. She did not like teaching, and this, too, turned her away from her earlier goal. She has an A- average in sciences. She likes to work neatly, likes to take her time and do her work carefully and thoroughly.

She thought arithmetic was easy in grade school but she didn't think of herself as all that good in math. In the 8th grade she kind of grabbed hold and her work in math fell into place and improved. Before this she was doing about B work and since then she's gotten A's. She finds math theory more interesting. She likes trig. better than algebra and calculus best. She likes to think about the theory of math.

She works as a volunteer at the university medical center. She is in the Pre Med Club at school and belongs to the Medical Exploring group of the Boy Scouts. She gets to observe and be involved with physicians. About two years ago she became ill and was taken to the emergency service of a local hospital and was very impressed by the physicians there.

Her father died two years ago. Her mother worries about having to work hard if she goes on in the sciences and because of this discourages her. She has very poor study habits, doesn't get going on her work until very late at night and sometimes studies until 5:00 in the morning. Her mother wants her to marry. She would, maybe, but not until after medical school. Her mother wants her to go to a college that has Chinese students so she will meet someone she will marry.

Her friends are mostly boys but not one is her boy friend. Most of her friends are going into medicine and one is going into the dental hygiene field. She says she is into women's lib, especially getting good job opportunities for women.

She feels her junior high school teachers were pretty good and that she has learned well from her high school teachers. She does not feel that she has gotten much encouragement in school for her goal of medicine. After she becomes a doctor she could see herself spending fifty-one percent of her time in medical practice and forty-nine percent teaching medicine. She likes to know she is helping people.

INTERVIEW 270

She is a red headed young woman, with a tiny, slender figure. She is attractive and quite tense.

She is planning to be a chemist or Chemical Engineer. She first had Chemistry in the 8th grade in a private Lutheran School as part of a Federal Science Course. She had no more Chemistry until the 11th grade but then didn't have good teachers. At the end of the second semester she couldn't stand her teachers but liked the subject and is now in AP Chemistry.

Chemistry has so much variety that it is never dull, always a change. She did well in Biology but didn't particularly like it. Unlike Chemistry, it did not involve problem solving, something complicated until you work it out. You experiment and see things done together. She didn't like dissecting in Biology.

In math she always did pretty well. First course she didn't like was CP 5 Algebra 3, but then Geometry and Trig. and Analytic Geometry. She has excellent teachers for them.

She has always analyzed things which she pursues. She has it from her father. When he explains things he puts everything out step by step in a very coherent way, and so she got in the habit of thinking that way. He is very smart, so she could also have inherited it. Her father plans offices (space analyst) and was in Engineering.

She has brothers of fourteen, eight and three. The oldest is scientifically inclined, but not mathematically. When she really needed help in math she went to her father, and because he is so analytically inclined he figured it out and he still can, even though she is beyond his math educational limit.

She is going to UC Berkeley and has always planned to since she was small but figured she couldn't afford it. She has applied for a scholarship. She might go to San Francisco City College for the first two years to save up. She would be able to live at home. She knows that UCB has the highest Engineering School in the country and a separate College of Chemistry where Chemical Engineering is located. Chemical Engineering is appealing because it is more applied that Chemistry.

How does she know about it? She heard of the school somehow, read a description, talked to her Chem Teachers and friends, maybe her counselor, she doesn't remember, hasn't been to the VICCI Center. She did see a sign on the Bulletin Board which led her to write for a scholarship.

This idea has not come from hare parents at all. It is a field more open for a girl, encouraging, there is a better chance of getting a job than a boy.

She has tons of friends, widely spread interests, is not going with any one guy. One she likes a heck of a lot was interested in Chemistry and kind of helped her and made her less nervous about AP. There are only two girls in the whole class and twelve or thirteen fellows.

INTERVIEW 277

She is a somewhat scrawny, wispy young woman wearing glasses. She is an only child of parents who divorced when she was seven. She can't remember her father. Her mother let her do what she wanted but she doesn't know where it got her.

She thinks her plan to go into Architecture and thence into City Planning may have derived from the fact that her mother used to work in a model house as a hostess and took her along. She used to spend a lot of time there. She likes going through fabric stores and looking at furniture and so does her mother, but she doesn't know if this was an influence. They have twice lived in Eichlers which she likes. She enjoys looking at buildings. If she didn't go into Architecture she would go into Biological Environmental work concerned with buildings. All her close relatives have to do with the environment. Her mother's brother is a forest ranger and his son is in agriculture.

In the 9th grade the teacher gave them a form for the Explorers Group (Boy Scout sponsored). She checked Architecture, the group called her up and she joined, the only girl. She is now working with them on an AIA competition for a self-sufficient house.

She doesn't know if she just picked out something unusual to find out about and then it developed. When she told her mother she pushed her to get involved to see if she liked it, suggesting she take Mechanical Drawing to find out. She has now had it for three years: beginning mechanical, architectural, likes it and is doing well. She is all right at sketching. She is doing rendering, doing okay, and getting better. She can't do well freehand, and has trouble with perspective. She has taken out of school work in leaded glass and in ceramics at Randall Museum and classes in painting at the De Young.

She talked to her counselor, asking about architecture. The counselor just said to look in the VICCI Center. There she read about courses, requirements for Berkeley. She has never talked to anyone in the profession since she thinks architects just push their own school. She really isn't sure what attracts her. Houses are important. She likes looking through books at them. Also it is supposed to be getting a lot better as a field for women.

If she works hard enough she can do math and science. She loves puzzles, doing them. She used to be very good at math getting A's through Junior High School. At high school her first teacher was not very good, was strange, so her CP 8 was not a good basis for her math and she has not done as well since. She enjoyed geometry, does not like analytical geometry or algebra. She likes less abstract math. In the 9th grade she had a woman teacher who taught her a lot. She had been a Marine Sergeant and had a very loud voice, she doesn't know if that was any different from having a man teacher. In the 10th grade CP 5 was a C, Geometry then B, CP 6 a C after two others.

She has done about average. CP 7 was a D+, all indicating that not so good basis she came up with after having wanted to major in math. She likes it well enough to keep trying however, and now plans to enter City College as a freshman taking a few classes over to prepare for college.

She is best at social studies but doesn't like it because it is meaningless facts, not thinking, and she likes doing things that are harder, a challenge. She likes to understand principles.

She enjoyed Biology and Chemistry, finds Physics very hard, averages B in Science. Architecture combines Science, Math and the Environment.

She has no boy friend now and is a little embarrassed about it. She would enjoy being married. She is not a libber, is old fashioned, and feels that women should have the right to work if they want or not - to do what they want.

She has been a life guard in the summers but what takes a good deal of time is her office as Worthy Adviser to the Rainbow Girls.

After City College she wants to go away to college. Maybe Cal Poly, but most likely her mother's College - Goucher where she can supplement the curriculum with engineering courses at John Hopkins or the University of Maryland. She plans for Graduate School of Architecture.

INTERVIEW 323

She is a petite, attractive looking Filipino American young woman. She speaks with a slight accent, acts uneasy and self conscious, with a self-effacing manner.

She will be attending the large university in the area, will live at home and commute to school. She plans to take Business Administration, Accounting and Math.

She attended parochial schools for all of grade school and junior high school and has been in public school for all of high school. She likes public school better because there are so many more and different people and this gives her more chance to meet people. She remembers starting arithmetic in second grade, liked it right away. She always liked doing her math homework because the problems were clear, she always understood them and the assignments were short. English was harder for her, she wrote too long sentences and wasn't always sure what it took to do well in English. In the 8th grade in parochial school she was in a college prep. math class and had a really fantastic teacher. The class was very advanced and she really liked the challenge. She thinks her best subjects are Math, Language, Creative Arts and English; but she likes Math best of all. She does not like science or social studies.

She took General Science in the 8th grade and her only other science is Chemistry which she is taking this year. Her teacher for this course is good but she is not interested in what she is learning.

Her parents and her friends have told her to become a doctor. Her mother has a Dentistry Degree which she earned in the Phillipines; she had practiced Dentistry there but not in this country. She does not like to see people suffer and would not be a doctor just for the money. She sometimes wonders if she refused to consider being a doctor just to be rebellious.

She knows that what she really likes is office work, and when she says this her friends think it's silly. She has been helping her father with his business since she was very little. Her father owns barber shops and beauty salons and owns and rents property. She works right along side him and together they make out payroll checks and keep the books. Because of this experience she feels she is very familiar with the office work involved in operating a business and likes it all. Her father takes courses at the local college and because of this has a large library at home. She had read his books about business, business law and real estate. These readings got her even more interested and more sure that she wants to study business and accounting.

Her oldest brother is in his twenties, is out of the home, and she does not know what kind of work he does. Her second oldest brother is nineteen years old, is attending the local community college and plans to study architecture. Her fourteen year old brother is less studious than any of the other children and likes working with his hands and building things. In addition, there are three younger brothers. She is the only girl.

She has been and is currently a teaching assistant in her high school. This Semester she is helping out in a college prep. math class and has assisted in other math classes and in Spanish. She does not like lecturing in front of the class because she is too shy. She much prefers helping individual students and grading papers.

Her counselor at school doesn't know her. One of her high school math teachers has been very interested in her, cares about her future, is interested in her plans and tells her she has a lot of potential.

INTERVIEW 328

She is an attractive looking, very poised and mature youna woman. She is very self-confident, has a direct, open and forceful manner.

She wants to go to medical school but wants to do medical research, not clinical practice. She feels she can help more people by what she can discover in research than by medical practice. Her first choice for college is Yale. She also applied to Radcliffe, Williams, Swarthmore, Stanford and U.C. Davis. She really wants to go to an eastern college because she wants to be out on her own in a new and different social setting.

She has always been pretty good in math. Her parents say she has a logical mind. In grammar school her teachers thought of her as a marginal student and she saw herself in this same light. However, she remembers that she did well in arithmetic and that it was easy to learn. In Junior High School she was put in the top track Algebra, and in the 9th grade she was one of the top students in math. In High School she is no longer at the absolute top but still enjoys math. She found Geometry easy, Advanced Algebra was hard to understand, learn. She is taking Calculus now and finds the ideas are more complex and she has to work and think more quickly. Last semester she got an A in Calculus.

She first became interested in science in 8th grade when she took General Science which was mostly biology. Her teacher was good. She took another General Science course in the 9th grade and found it even more interesting. This was when she first got interested in medicine and her father kind of encouraged her. Her father is an M.D. and is an admissions officer at the local medical school. She took Chemistry in 10th grade and did not like her teacher because the teaching was really bad. She resents this because Chemistry is an important subject for her and one she really cares about. She feels she didn't do well in chemistry and didn't learn what she needs to have. She is now taking Physics, likes it very much and plans to take courses in both the physical and life sciences in college.

For the past two summers she has worked in an organ preservation laboratory which is part of the local medical center. Her father works there and helped her get the job. She had her own research project, has written a paper on the results of her project which will be published in a professionla magazine. She finds this very exciting and really enjoyed the work. This experience made her even more sure of her plan for medical research. She is a national finalist at a National Science and Humanities Symposium. She came in third, the first and second place winners were men. She feels quite certain that the judges were sexist. Her parents have always brought her up to think herself equal to a man.

Her mother started college in engineering in a midwestern school but was pressued out of the program because she was a woman and because her high school preparation had been very poor. Her mother was very disappointed, became a secretary for a while, then worked in a hospital as an X-ray technician. After her father finished medical school her mother stopped working.

She knows she won't have children because she doesn't want to devote her life to her children and this would not be fair to them. She feels that if she cannot do as good a job being a mother as her own mother has done she doesn't want to be a mother. Until three years ago she thought she wanted marriage. Then she met a guy she likes who will never marry. She admires his ideas, feels she is a strong women's libber and now is considering never getting married.

She has never been "incredibly popular". She only has two close men friends and two close women friends and no steady boy friend.

Her teachers have been good and bad and she tries to make the best of what she gets. Her school counselor is very encouraging and helpful. He has helped her get information about schools.

She has two younger brothers. The fifteen year old is in her high school and is sort of interested in science but has trouble in math, and she tutors him. Her father tries to help him but usually calls on her to take over on tutoring math. She thinks this brother has a real talent for writing. Her thirteen year old brother is supposed to be a genius with a very high I.Q. He won't read or do school work and it troubles her that he hasn't any motivation.

INTERVIEW 344

She is an exquisite Chinese young woman, thoroughly self possessed, charming.

Both mother and father are members of large families. The science people are on her father's side. One of her uncles is a Professor of Engineering at a university campus, she has an aunt who is a chemist, she has a couple of uncles in Electrical Engineering and Mechanical Engineering. The closest her mother came to science was when she worked as a receptionist for her dentist who spontaneously offered her a job. Father is a Chief of Systems.

Her brother, twenty-one, is studying Electrical Engineering at UCB, but her sister, fourteen, is not interested in these areas.

Her most significant science experience was in the 8th grade, her first science course. Oh gee, it is a big thing, she felt, now I am in the 8th grade and can take science. They dissected a shark's brain. In the 9th grade she decided she liked Biology, she had a really good teacher in Physiology and liked it. Chemistry she didn't like nor did she do well in it. In Biology and Physiology you can see the things - in Chemistry everything is just a bunch of symbols. In Physics she is now in AP and doing pretty well. It deals with mechanics and you can picture it. Electronics and Magnetism are hard but you can still see them, picture them.

She has taken a lot of math but not excelled in it. She has liked almost every math course, she likes to do the work, thinks she must be crazy! When she gets going on math she always likes it. Often she doesn't grasp the ideas of the teacher until they are explained again and then it is too late until they are brought up again in midterms or finals.

She doesn't like languages, they get on her nerves. She doesn't speak Chinese which is not spoken at home.

Math is the only thing she has to really, really try for. Math and Science are the only things she studies for and she doesn't study enough (all grade averages are B except Math B-).

She intends to start at San Francisco City College and transfer to Davis or Stanford. She hasn't been able to see trying for super, super grades. She has decided on social life now and grades in college.

She has been thinking of medicine since the 9th grade. Her biology teacher talked with her and she looked into it. Otherwise she joined the Medical Explorers division of the Boy Scouts which met at a hospital in the 10th grade. She got to see a hospital and liked what she saw. Next year she joined the Allied Medical Program. It was a good course. She got to do things and to take a certain amount of responsibility.

INTERVIEW 350

She is slight of build, is very enthusiastic and energetic in manner. She seems concerned and uncertain about her future. She has a slight accent, is clearly oriental in appearance.

She would like to go into biological research but thinks of this goal as a dream rather than an attainable goal. She has been accepted at the university in the area and very much wants to attend and live on campus. She has applied for scholarships which she must have to make all this possible. Her parents want her to attend the local community college, live at home, and also have a part-time job. They feel that if she goes to the university, the work will be so hard she will not be able to work part-time.

Her parents hoped she would major in math in college. Her mother says math is practical because she could then be an accountant or work with computers. Her father has been pushing for her to go into applied math or pharmacology. Both parents have expressed strong disapproval of anything in the humanities and arts. Her mother's brother is an artist, has always struggled to just barely make a living and they do not want that to happen to her.

She would like to take a general life science undergraduate major and feels she would pick life sciences because she likes them. Both parents do not believe you should be happy in your job. She feels very strongly that she has to have a career in science. If she insists on this her mother has agreed that she could be a medical technologist.

She came to the United States from Hong Kong when she was six and a half years old. She was put into an ESL class and feels she learned English quickly and without difficulty. Her parents speak very little English. She liked arithmetic in grade school and found it easy to do. She really liked algebra and geometry although she felt her teacher was hard. She has always enjoyed solving math problems but does get bored learning about imaginary numbers. Actually she finds math more boring than science.

In the 8th grade she had general science which included astronomy, geology, meterology and a little bit of physiology. She liked everything in the course. She liked her 9th grade biology course even more although she wasn't especially interested in the part about animals. Her mother likes plants and this has recently become her interest, too.

In the 10th grade she started in physiology, didn't like the teacher, dropped it and changed to chemistry. She liked organic chemistry but found calculations in chemistry boring. She thinks physical chemistry and math are more boring and biology is more interesting. Even though she liked organic chemistry she isn't sure she always understood it well enough.

She is now reading books on botany on her own and finds it interesting. This has made her think about studying plant pathology. She likes reading about new discoveries in the sciences and this is why she thinks she would like biological research. However, she sees this as a very tough field, very competitive, and isn't sure if she could make it, that is, if she is smart enough. This year she is taking Art History and Music at the local community college. She is really enjoying the Art History but would never consider it as a career field. She has been criticized by her parents and her school counselor for jumping around to so many fields and has been told she is flighty. She doesn't agree and feels she wants to get exposed to as many difference experience as she can and to explore. She guesses that if there isn't enough money for her to go into studying science for research she will settle for some paramedical field.

Currently she is working at the pharmacy at the U.S. Public Health Office. She really likes this, is fascinated by the names of the drugs, feels there is so much to learn and this makes it exciting. Last summer she worked in the Physical Therapy Department of a large medical center as an aid. She did not like seeing and being around sick people and did not get along with the people in the department or the patients.

She belongs to the Pre-Med Club at school and learned a lot about fields from speakers who came to the club. She also looked up information in the school on medical technology. She would never go to her school counselor for such information or for any help. She said she hates her school counselor because the counselor is never there. She feels her teachers have been pretty good in how they teach except for the physiology teacher, that her teachers have been nice to her but have not been encouraging.

She has two younger sisters who both read a lot but don't as yet seem to have any special interests.

INTERVIEW 438

She has a very pretty general appearance, very careful grooming and makeup, and quite feminine in mannerisms. She is quiet, passive, does not easily carry the discussion.

She has decided she will be a landscape architect and hopes to be accepted to a small state university in the midwest which has a five-year landscape architecture program. She chose this school because her father lives in the city where this school is. Her parents were divorced ten years ago and she hasn't seen her father for the past one and a half years although they used to be close when he lived out here. She wants to get away from home, to meet new people and be closer to her father again. Her mother doesn't want her to go so far away to school but does want her to have a career and likes the idea of her studying architecture. She likes landscape architecture because it's a field with lots of opportunities for women, she likes being outdoors and would like making something appealing for the public to enjoy. She has always wanted to go into a big field and knew she didn't want to be a doctor. She first heard about architecture from friends but was not interested in building houses. Then, last year, she attended a Career Night at high school and for the first time heard about landscape architecture. When she began to consider this field she went to the high school Career Center, not to her school counselor, to get help. At the Career Center she took what she called an "aptitude" test but from her description of the test questions this sounds like a vocational interest test. She then looked up her scores in a book but she had no one to talk to about the test results and feels this was not too helpful. However, at the Career Center she found some information about landscape architecture and also looked at programs listed in college catalogs.

Math has always been her easiest school subject and she learns math best by seeing examples worked out in a book rather than learning from a teacher. She likes algebra much better than geometry and find working with geometric shapes harder to understand. In grade school she never liked arithemetic because it sounded like a hard subject to her although she really didn't find it hard to do. When she was a high school freshman she couldn't see how math would help her because she was planning to be a speech therapist then. She worked as a volunteer with retarded and handicapped children and found she felt too sorry for them and couldn't help them. As a result of that experience, while she was in the 9th grade, she dropped the plan to be a speech therapist and began thinking about architecture and also a little about engineering and math became a useful subject for her to learn.

In 7th and 8th grade she took General Science where she learned about plant evolution and basic life processes. She took Biology in 10th grade and found it difficult. In this class the teacher expected her to be independent and work on reading on her own. She found the reading hard to understand and wasn't ready then for so much independence. She took Chemistry in the summer between 11th and 12th grade and liked it very much. In this class the reading was related to the things she did in the lab and what she learned seemed very specific and very applied.

She has two older sisters and admires the second older sister because she is independent and successful. This sister went to college, majored in economics, and is now working for the Federal Government as an auditor. She does not admire her oldest sister who is currently unemployed. She did not finish her college schooling, was a desk clerk in a hotel and has never had any direction to her schooling.

She has been going steady with a boy for the past five months. Before this she did not have many dates.

She likes her teachers, feels personally close to many of them and sees them as her friends as well as teachers.

INTERVIEW 446

She is a very tall, large young woman with bands on her teeth and long hair.

She likes Math, is pretty good at it, it comes pretty easy. Her dad's pretty good at Math and she got some of it from him. He is an industrial engineer from Stanford, her mother is a nursery school teacher but has also taught first grade.

She has a twenty-one year old brother, a Math major at Stanford, a nineteen year old sister in the Nursing Program at De Anza Junior College and a fifteen year old sister who is not as good as this girl and her brother. She is above average but not so interested, she likes athletics. At the dinner table the father and brother talk about problems, equations. She never understood it and wanted to.

She has had good teachers except in the 6th and 7th grades. She was turned off for a while but when she got back to good teachers in the 8th grade she became interested and has had all A's.

Science she likes okay but is not superinterested. She didn't feel like working as much as in Math. There she feels as though she has accomplished something if she can solve a really hard problem and get the right answer. She is taking Calculus AB, got a 3 in the AP test on it. She could have taken the class this year but decided not to, because she was really busy with other activities: drill team, and team at church, a youth group in which she is on the council which plans activities for all the youth in the entire district. It takes a lot of time. She is tired of studying all the time. She doesn't need more time on Math, it hasn't taken a whole lot of studying, she has understood most of it the first time. When she has needed help she has gone to her brother or father or teachers. She has had biology and chemistry, has liked them but wasn't really thrilled. She likes math best.

She is going to UC Davis for Agricultural Economics and farming. She has lived in cities all her life (Sunnyvale!) and always wanted to live on a farm. She has gone camping with the family and spent summers out of doors and likes the out of doors. Ever since she was little she has thought it would be neat to live on a farm. She will work on one some summer during Davis. She wants to grow crops, food, some animals, plants.

What does she know about it? Not very much. She went to the Career Center and looked for colleges which have those programs. There was no occupational information. She has not talked with a counselor. Davis has a lot of majors in the catalogue which she looked at. If she changes her mind, she might go into Agricultural Research. Her choice of Agricultural Economics is unrelated to math or she doesn't know the relationship. The major is appealing for her other interests but she is sure she would have some math in the major.

Her parents don't really think she should be a farmer. They say she couldn't take it and she's too smart. Besides where would she get the money for a farm? However, they have accepted the fact that she will study agriculture and may end up in research. They also have accepted the fact that she isn't going to Stanford where there is no Agricultural Program at all. Besides there is the cost. Her SAT's are V 510, M 760. She received letters from MIT and Bryn Mawr.

Her social life is church oriented, activity oriented. She meets guys there, girls at school.

INTERVIEW 449

She is chunky in physical structure and boyish in appearance and mannerisms. Quiet and reserved, responses slow, and she sometimes seemed uncertain as to how to put her thoughts into words.

She has decided to major in computer science in college and wants this major related to math not to engineering. She will start college in the local community college and live at home. After one year there she will transfer to either a state college or a large state university and will live away from home. She prefers the university because it has an especially good combination of math and computer science courses. She had not decided what she wanted early enough and did not make application to the university for her freshman year in college. She chose computer science because she has always been good in math and because her father has always said she has a very logical mind. She knows she likes working with details and is a neat person who always organizes things and puts them in order.

Her father first suggested computer science to her. He arranged an appointment for her to talk to a woman who is working in this field and she got very interested. She then began reading occupational information materials about this field. She first looked for such information at her high school's Career Center which is run by volunteer mothers and found that the center had very little material. "That housewife there didn't know anything or help me at all." She found most of the material on computer science in the public library and in things her father brought home for her to read. Her father is an engineer and he also supplied her with a lot of information about various aspects of engineering.

In her current high school math class they spent three weeks learning about computer programming which she liked and found easy to do. In addition to her current high school courses she is attending the local community college, taking Sociology this quarter. Last quarter she took Psychology at the community college, liked it very much but would not like to work in this field because it's so far removed from math.

She remembers that in grade school arithmetic always came easily to her and she liked working the problems. She has always gotten A's in math. Her dad has always helped her whenever she got stuck and didn't understand her math. She always wants to know why a mathematical formula is the way it is and why it works. Because her teachers and her books don't explain this she always goes to her father who does give her such explanations. She knows that she can learn and remember anything if she can visualize it or related things logically or know why something is or works a certain way. She is having trouble in History because she can't find a system that works for her so she can remember the dates and names. Her mother is good in arithmetic but not in the more advanced math and is no help to her.

In the 7th and 8th grades she took general science where the emphasis was on biological sciences. Her only other science course was Biology in the 10th grade. She found dissections very unpleasant and upsetting, the smells made her feel sick, and she was not interested in any part of this course. She wishes she were taking Physics this year and is angry at her school counselor for not telling her that she needed Physics for computer science because now she will be behind when she starts college. She further blames her counselor for getting her to take an experimental math course in her freshman year in high school which did not count for algebra and has put her behind in subsequent math course sequences. This year she is taking Advanced Algebra. She said, "I want you to know that the counselors aren't any good. They make mistakes. They messed me up with wrong advice on courses." However, she feels her high school teachers are good.

She has a younger brother who is in the 8th grade, loves plants and wants to be a landscape architect. He gets A's in everything and works very hard. She does not work as hard as he does in everything, only in things she really likes. There are two younger adopted children. The younger boy is in the 4th grade, is artistic and good in sports, and there is a possibility he has brain damage which may explain why he doesn't do well in his school work. Her younger sister is in 2nd grade, seems really smart and good in arithmetic. Her little sister bothers her because she cries a lot but she has no idea why she cries so much. Within the family she is closer to her father than anyone. She sometimes fights with her mother, never fights or argues with her father, and sometimes she gets along okay with her mother.

She has a steady boy friend whom she met when she was a freshman in high school. She has never dated anyone else. Her boy friend is in the army, has been stationed overseas since last summer. He should be out of the service in a year if he doesn't get into trouble which, she says, is very hard for him not to do. She doesn't know if she will want to get married and not at all sure she wants children because little kids bother her. Her girl friends interests are very different from hers. Her best girl friend wants to get married right after high school and is not very smart in school. One friend is interested in sociology and wants to be a physical therapist, and another wants to study music theory.

INTERVIEW 450

She is a lively, bubbling, refreshing, wholesome young woman, who has listed herself as a Native American. Her mother told her to, although she is only 1/32 Cherokee.

In the 7th grade she was placed in an accelerated Math class and took Algebra in the 8th and did really well in it. She went to a Catholic School which was always ahead of public school. In the 6th grade she went to public school and was ahead, got a head start.

She has been continuing to take Math since her freshman year when her Math teacher said she had a flair for it and put her in Geometry A accelerated class as a sophomore. She had really good teachers and understood everything when nobody else did. She is in Calculus A B now, the first half of the Calculus program. She doesn't know if she understands it all but she likes it.

Her dad is a Math computer man at a large aerospace company. Her father's sister is a cytologist married to a Math Ph.D. at a prestigious eastern college. Everybody else in the family farms. Her father is doing top secret work and isn't allowed to tell what he's doing, so she doesn't know much about it but thinks he's in charge of computer programming. He works very hard. That's how she got interested in Math, more "when he was helping us with our homework than when he was talking about it", although she got the feeling that he really enjoyed it. She hasn't always needed his help because she has had the feeling she can do Math. It's not her mom's thing. Her brother is taking Trigonometry now and doesn't say anything about it but her sister is in Algebra and doing really well.

Her grades in Math are least good. She has to work harder at it than other classes; it is the hardest subject in relation to the work involved but she really likes it. Maybe it is because she has to work hard at it that she really likes it. She got a B her first semester in Calculus because she blew the final. Math is never boring and her teachers have all been really good.

She seems to do fairly well in Science - has had A's all the way through. She didn't have a fantastic Chemistry teacher and was turned off. She didn't like Biological Science as well as Chemistry; she didn't enjoy it, it wasn't a good experience, and she hasn't taken Physics.

She intends to head for Computer Science. She wrote out a program in Math class and was so excited. She feels that computers are used as a tool to solve problems, they fascinate her, they're really neat. She doesn't really have very much information. She went to the Career Center with a couple of classes in Physiology to look at Medical careers. That didn't look like her thing. She took up computers but the materials didn't really explain what you do. She was in the Computer Club for a while but it met at the wrong time and she didn't stick. Has she talked with her counselor? Yes and no. The counselor usually doesn't have a lot of time to sit and talk. The counselor thinks she has the ability for it. She would like to keep up her French, having already had five years of it, and work overseas. She has been to Switzerland and France with the Foreign Study League and enjoyed it very much.

She is thinking of going to U.C.L.A. She went down in September with her grandfather. It has a good Computer Science department. If she changed her mind and decided to go into another field, they would have that, too. She has been accepted. She has also applied to Stanford and Washington University. She would probably go to Stanford if she gets in but can only go with a scholarship even if she commutes. U.C.L.A. told her that for being Native American to help her she needed to be one-quarter Native American. Her dad says she would go if she gets in. She doesn't know where they'd get the money, but he says she would.

When she was considering Washington University she didn't go there, but two graduate students from Stanford came out to the house and told her about the program in Computer Science. They said it was really neat and they thought she would probably do well. She indicated on the PSAT that she would like to hear from colleges and she has received tons of stuff which she has piled in a closet. Notable was Case Western Reserve. Her SAT's are V 610, M 630, Achievements Math 640, English 670.

Her friends are mostly interested in drama and not that many girls are interested in Math, only one or two among the seniors. The boys? Everybody in Calculus is good at it and she has no problem there, but they are mostly juniors. As a freshman she was at the top of her class and boys resented her. Since then she has had no problems and none with the teachers. "Am I Miss Popularity? No, I'll be very lucky if I get invited to the Senior Prom."

She has taken a lot of drama and was the official seamstress. She will probably change her mind about what she wants to do several times yet. Right now Math is a very real possibility. The other thing she is interested in is costume design but there are not so many openings. There is more of a future in Computer Science, her father feels, especially for a girl. She does intend to have a career.

INTERVIEW 480

She is an attractive looking young woman, wears glasses. Through most of the interview she did not look at the interviewer but sat sideways looking down or staring at the wall. She was clearly upset, depressed, and angry. She referred to problems in her relationships with peers, her sister and with her mother. Her self-concepts are threatened and her career commitments seem very uncertain. It seems that she has just recently begun to question whether she has the personal and emotional prerequisites she would need for her career choice.

She has just been accepted to the campus of the state university which has an excellent program in her planned field of study in Veterinary Medicine. She is in the Boy Scout Veterinary Exploring Club. She knows she should get some experience in this field but has been too "chicken" to approach anyone in the club to arrange to work with a Veterinarian. Two years ago she passed out while observing animal surgery and knows she has to check out how she feels about this now.

She has wanted to study Veterinary Medicine since before high school. There have always been animals at home. Currently she has three cats, a dog and two rats. She has taken horseback riding lessons for the past four years, has always wanted her own horse but never had one. She grooms the horse she rides. At home she treats the superficial wounds of her pets and likes to train her dog. Her mother has always liked animals but is very emotional about them. She sees herself as having a more clinical interest in animals. She observes animals because she is interested in their behavior and personality. She has a "Skinnerism" kind of interest and has done some reading on animal behavior. She has begun to think that if she can't stand the surgery in Veterinary Medicine she might go into animal and veterinary medical research instead. She also has been thinking about studying Animal Behavior of Zoology. In college she plans to take an Animal Science major and a Zoology minor. She has also heard that you have to be compatible with people to be a Vet, and she's worried about whether she can be because she has never been outgoing and has never gotten along well with people.

She has always liked math until this year. She had the same teacher for math until now. Her current math teacher makes her learn from the book by herself with very little help in class and she resents this method. She is thoroughly enjoying all she is learning in Physics this year. She has most liked Physiology because it's about living things. When she took Chemistry it was an innovative program where she worked on a contract basis and at her own pace. She liked this much better than the over-regimented type class and feels she handled the independence and self-direction well and learned a lot.

She says she has no really strong interests or strengths, and that she does equally well in all her courses. In spite of her 4.0 grade point average she speaks of herself as not being unusually good in anything and believes her teachers see her as just a usual student. Her teachers have told her she did best in art and languages. She felt she was weaker in math and science, so she worked extra hard on these subjects. She thinks she likes these better but now is not so sure, and wonders if she has worked hard in math and science to try to prove something to herself. She loves reading and discussing what she has read and likes English Lit. readings. She feels her school counselor hasn't been very interested in, or enthusiastic about, her plans. She thinks the teachers and her counselor see Veterinary Medicine as too hard for anyone to get into and so they don't encourage her. She feels it's none of their business and she doesn't want people in the school to know too much about her. Her mother is very pleased with her plans. Her father is not too happy that she had decided on a specific field so early in her life. He has been encouraging her to explore other fields, and although she hasn't, she now wonders if maybe he's right.

She says she has only one friend whom she has known since the 6th grade and who is now at a private university taking computer science. Some people she has known casually are into interests like drama, speech, debate; and one other acquaintance, a girl, is now in college studying forestry. She says she doesn't know how to make or keep friends. She hangs around with her younger brother's boy friends, likes to observe what they do but isn't really doing things with them. She has never dated a boy. When not in school she spends most of her free time reading, walking and training her dog. She is active in sports, although she says she really is not all that interested in the sports in which she participates. She goes motorcycling mostly to be with her father and to bug her mother who doesn't like her to do this. She goes waterskiing to be with her family. The sports she really likes and considers her own are back-packing, horseback riding and dog training.

Her older sister is a college freshman at the university she will attend and probably will go into behavioral sciences. Her brother, a year younger than she, is a junior in this high school and plans to go into the Air Force and learn to be a pilot. Her younger sister is in grade school and doesn't seem to have any special interests as yet. She feels she has followed behind her older sister all her life and is angry about this. She especially resents her older sister pre-empting the university she had always wanted to go to, and because of this she isn't very excited that she has been accepted there. She has decided she cannot let herself be excited about anything so she won't be disappointed. She has definitely decided she will never get married, and since she gets along horribly with little children will never want her own.

INTERVIEW 494

She is very poised and self assured and very forthright. She has considerable self-understanding.

She has been accepted and will attend Wellesley which was her first choice. She plans to take an interdepartmental major in molecular biology, with her ultimate goal being medical school. She wants her undergraduate schooling to have a heavy emphasis in chemistry. She has won a Merit Scholarship from her father's company.

She was able to read when she was four years old. All her life she knew she was smart and always felt she had to look smart. By 5th and 6th grade she knew she wanted to be a doctor. In 6th grade her class worked on science projects. She built a microscope from a kit and did some experiments on rats. She liked this and also liked her teacher. In 7th and 8th grades she had general science and reports nothing special about these classes. In 10th grade she took chemistry. Her teacher was poor and was no help, so she had to learn the subject herself. She found it interesting and challenging to learn independently. She had one year of Biology which she felt was just an average course. This year she is taking Calculus, Advanced Placement English and Physics at the local community college. She finds Physics easy and likes it. This year for the first time she is concentrating on learning.not on getting top grades, and she likes this new reason for taking courses.

In the 9th grade she was a Candy Striper Volunteer in a hospital and assisted the nurses. Last semester and currently she is in the high school Work Experience Exploration Program. She was placed in different departments in a hospital to observe and now helps with patients in the emergency room. She sees this as a very positive and important experience which has made her even more sure of her plan for medical school. She loves helping people and has scientific ability and talent and wants to use it. She could never be a "welfare psychologist" because she wouldn't be using her talent for science. She has always known she was tops in science and math.

In grade school she found arithmetic really easy and has always liked and done equally well in all her math classes. She feels her math teachers have always been good but her science teachers and her science classes, except for 6th grade, have not been any big thing. However, she likes science and math equally well. She enters math contest for fun and wins prizes.

All of her life she had this thing about being smart, not about being a girl. Because she was smart and had to always look smart she feels she has been left out of things by other kids. She feels she has lost out in social life in high school because she was seen as a "brain". Because of this she wants to go to an all girl college as a way of separating what she is academically and what she can do socially. This year for the first time in her life she has let down and has a social life. She says she is now doing a good job of hiding that she is smart, acts like a total idiot all the time, and is having fun, has friends, and is dating for the first time.

At home, there is a chemistry lab, a lot of electronics equipment and a dark room. All of this was made just as available to her as to her two older brothers and she was encouraged to use all these facilities by her father. Because of this she has never seen herself as limited in any way because she is a girl. Her parents have never made her feel she shouldn't go into science, in fact both parents have suggested medicine to her. Her current hobby is photography.

She has always been in competition with the older of her two brothers. He is twenty-three, has an undergraduate degree in Electrical Engineering from MIT, was in the top three of his class. He is now at Harvard in Business Administration and Law Program and earned first year honors. She has always tried to do as well as he. She doesn't want to be in the same field as her brother because that would be too much competition but she wants to compete with him for grades and level and difficulty of schooling. Her other brother who is twenty-one years old has never been as smart as she and her other brother. He is interested in biochemistry and photography. He has been in pain for many years and just recently a diagnosis has been made of a rare tumor which may be terminal. When she heard this, it made her think that all of her life isn't in the future only and this decided her to reorder what's important to her. That's why she decided to have fun and a social life this year.

She sees her school counselor as a good friend but not as someone to help her in any big decisions. Her older brother and her parents are the only ones who really help and encourage her.

INTERVIEW 458

She is a quiet young woman, somewhat retiring and reserved, not forthcoming. She is Eurasian, father Chinese, somewhat petite, slanted eyes are only other physical characteristic.

In math she is now taking calculus on a community college campus for college credit. She really likes it, it's fun solving problems like that. She has always liked Math. She doesn't remember much about it in grade school, except that she liked it then, too. In elementary school her mother helped her mainly; since high school her dad has. She can always go to him with problems and he enjoys helping her. Her father has a degree in Civil Engineering from an eastern Ivy League college and has also attended a university in Peking. He is now a civil engineer at a large aerospace company working on the missile wharf design.

Her teachers in Math have been pretty good all through. Math usually comes pretty easily, although she has to work hard at new concepts that she never had before, but after she has once gotten it, it comes pretty easily. She has had straight A's in Math.

She has really been enjoying Science in high school but didn't that much in grade school when it was about rocks and insects as a separate Science course in the fifth grade. In other grades it was worked in and it seemed as though it just sort of came along with school work. In junior high school she began to like Science, and in high school. She liked Oceanography and study of the environment. She really got into it when she got into labs, more labs, and in high school liked Biology, Chemistry and Physics - all of them. She likes Math a little better; Physics has a lot of Math and ties in with it. She likes Chemistry a lot; it has a lot of lab work. She likes the physical sciences better than Biology but likes that, too.

She would like to go to Stanford but it is pretty expensive. SAT M 750, V 700. Unless she can get enough scholarship money or financial aid she will go the first two years to De Anza Junior College. She is a semi-finalist for a Pacific Gas & Electric Scholarship and a plaque winner in 4th place for a scholarship from the Bank of America. She may possibly go to San Jose State College. She has eliminated UC Berkeley because her mother wouldn't like her to go there, would worry about her. Her mother was a medical secretary, is really good at everyday type arithmetic, but hadn't gone on. She was not disinterested, was really good at Math. Mother is now at home. She has a ten year old brother.

She is planning on civil engineering because she has always liked Math. She has even seen her dad working at home. He has a private consulting business and does field work for it. He works for people who need maps, oil companies and some individuals. She took drafting courses, thought drafting was fun, and did really well and enjoyed it. She has had three years, Freshman, introductory Sophomore engineering drafting and Junior Architectural drafting. She has worked with her father on his projects including for pay, in data reduction, drafting and surveying. She has really enjoyed doing it. She feels she would do well in field work and is inclined to it.

Her father never suggested this field to her. It is really funny it seems natural to her. Nobody ever pushed her or influenced her or tried to. It is fine with her mother and she feels pretty certain about it.

She knows what kinds of work there are in civil engineering, where you are employed, what the job opportunities are, and the salaries. Her father knows a lady in the area from whom he got her material from the Society of Women Engineers. She has heard career speakers at school in the field of engineering. She has picked up material in the career center, sent away for information on civil engineering, technicians, drafting and architecture. She hasn't discussed it with a counselor - she has already made up her own mind and so had nothing to discuss with a counselor.

At the beginning of this year she worked for a government agency doing drafting which was more like mechanical engineering. She really liked it. It gave her an idea of what it was like to work for a company.

Her father has a cousin in Pennsylvania doing something technical for Pacific Gas & Electric. Her father's father was an artist, one of two outstanding ivory carvers in China. Her friends are in various fields. Most of the young men are going into science related fields: physics, engineering, forestry. They accept her direction; she isn't aware of anything special about it. She herself is active in many things and finds it hard to fit everything in: music, ballet, sports, service activities.

XIV. DIFFERENCES BY SCHOOL

As part of the assessment of influences on the science and science-related interests and behaviors of the young women in this study, an examination was made of the individual high schools they were attending.

It was agreed that confidentiality would be maintained both for individuals and for schools. In this section, therefore, schools will be identified only by letter. The consequence of this is that differences, if they exist, cannot here be related to the community context as described in Chapter II, which may, however, in whole or in large part be the basis for the differences.

Although all items were analyzed separately by school, only those considered especially relevant to the school situation and showing differences will be presented and described. The small number of subjects from some schools and the very small number in the cells in various analyses precludes consideration of the importance of variations in responses by schools. What can be presented are the relationships between what the young women reported, following here, and what the school staffs stated (in the next chapter).

Despite the method of selection of this group by PSAT Math Scores, there are significant differences among the schools by PSAT Verbal Scores and accordingly by Verbal in relation to Math scores.

PSAT MEANS AND STANDARD DEVIATIONS AND DOMINANT ETHNICITY BY SCHOOL

		PSAT Scores						Dominant Ethnicity
		Verbal		Math		Math Minus Verbal		Percent of
School	N	Mean	SD	Mean	SD	Mean	SD	Sample Caucasian
A	89	53.6	9.9	56.3	7.0	2.8	8.9	70.5
B	37	50.7	9.0	55.5	7.0	4.8	7.8	97.3
C	71	46.8	7.8	54.2	5.9	7.3	6.8	94.4
D	28	51.4	9.5	56.6	5.7	5.1	7.6	85.7
E	151	48.3	10.0	55.9	6.8	7.6	9.4	50.3
F	37	49.4	9.4	55.1	7.4	5.7	7.5	86.5
G	18	52.1	9.6	54.3	5.6	2.2	11.0	94.4
H	69	50.8	10.0	55.7	7.6	4.9	8.6	95.7

These differences appear to be related to the characteristics of the communities and the composition of the student population which depends to some extent on admission policy. The percentage of Caucasians by school also bears some relationship to the community setting, with an average percentage of 76.2

Ages vary also. School E has 33.3 percent sixteen year olds in this group, School D has 19.2 percent, School A 17.9 percent, with School B 5.6 percent and F 5.7 percent.

OCCUPATIONAL BACKGROUND OF PARENTS OF YOUNG WOMEN BY SCHOOL (IN PERCENT)

School	Fathers Professional	Fathers Managerial	Mothers Housewives
A	56.1	19.1	24.7
B	37.8	33.2	40.5
C	45.1	18.4	26.8
D	57.1	7.2	25.0
E	33.8	23.2	37.1
F	43.2	29.7	51.4
G	11.2	38.9	38.9
H	49.2	21.7	43.5

Science-boundness, the basic concern in this study does differ by school:

PERCENT OF SAMPLE SCIENCE-BOUND BY SCHOOL

School	Sci.	Sci.-Math	Math	Total Sci.-Bd.	Non Sci.-Bd.
A	16.9	*18.0*	2.2	37.1	62.9
B	*24.3*	10.8	*8.1*	*43.2*	56.8
C	15.5	7.0	2.8	25.4	*74.6*
D	10.7	10.7	3.6	25.0	*75.0*
E	22.5	*16.6*	4.6	*43.7*	56.3
F	18.9	8.1	*8.1*	35.1	64.9
G	16.7	0	0	16.7	*83.3*
H	*27.5*	5.8	*7.2*	*40.6*	59.4
Mean	20.2	12.0	4.6	36.8	63.2

It is difficult to assess the differential contribution of the community and school, or indeed of earlier schools. It is interesting that two of the schools with the *fewest* science-bound young women are in the same district. The higher percentages of Sci.-Math oriented young women are in the schools with the greatest numbers of teachers who keep current with updated training.

COURSES TAKEN BEFORE SENIOR YEAR (BY PERCENT)

School	4 or More Sci.	8 or More Sci.	4 or More Math	8 or More Math
A	40.4	4.5	100	58.4
B	72.9	0	97.3	0
C	64.6	16.9	90.1	22.5
D	60.7	10.7	78.5	10.7
E	88.1	29.1	100	66.9
F	93.8	16.2	97.3	37.8
G	38.9	0	89.9	0
H	72.4	0	94.2	0

The number of science and math courses taken before the senior year shows a fair amount of variation. Is this a chicken/egg phenomenon? That is, does internal interest predicate these results? Or to what extent do offerings and teachers affect choice?

Grading practices within this study group of young women show differences which seem not to be related to differences in Mean PSAT Verbal ability levels reported earlier (and Math levels are similar, given the sample selection procedures).

A+, A, A- GRADES (BY PERCENT)

School	English	Math	Soc. Studies	Sci.
A	67.4	37.1	76.4	69.0
B	54.1	37.8	56.8	40.5
C	66.2	28.6	60.6	24.0
D	89.3	50.0	92.8	62.9
E	46.3	29.4	72.7	44.3
F	70.2	27.0	67.6	40.5
G	61.1	38.9	83.3	50.0
H	60.8	44.9	44.9	44.9

OVERALL GRADE POINT AVERAGES IN PHYSICAL EDUCATION DISTRIBUTED BY SCHOOL (IN PERCENT)

School	A	A-,B+	B	B-,C+	C	Dissatisfied With Own Grade
A	33.0	45.5	18.2	3.4	0	21.3
B	27.0	43.2	18.9	8.1	2.7	10.8
C	22.5	42.3	23.9	11.3	0	38.0
D	55.6	37.0	7.4	0	0	17.9
E	20.1	46.3	26.8	6.0	0.7	37.1
F	29.7	43.2	27.0	0	0	29.7
G	38.9	44.4	16.7	0	0	27.8
H	37.7	31.9	27.5	2.9	0	18.8

ASPIRATION FOR ADVANCED DEGREES, BY SCHOOL (IN PERCENT)

School	Father	Mother	Young Women
A	44.9	30.3	64.0
B	35.1	13.5	51.3
C	30.5	14.1	67.1
D	24.9	17.9	46.4
E	23.6	10.8	66.6
F	37.8	2.7	54.0
G	5.6	0	55.6
H	34.7	15.8	59.4

It would seem that such schools as G, for example, must be given credit for some part in raising the young women's aspiration level so very much above that of their parents. It is also worth comment that school D, seen above as performing easy grading within this group, produces relatively the lowest aspiration level, while the opposite applies to school E at the other extreme.

PERCENT OF YOUNG WOMEN PLANNING TO CONTINUE IN MATH AND SCIENCE, BY SCHOOL

School	Math	Science
A	45.0	65.2
B	37.8	59.4
C	43.7	52.1
D	35.7	60.7
E	49.0	57.6
F	43.2	54.0
G	50.0	44.5
H	36.2	52.9

Math and Science appear to operate independently of each other, suggesting many possible influences: teaching, courses, family, community influences, etc.

PERCENT OF YOUNG WOMEN UNDECIDED REGARDING COLLEGE MAJOR OR INTENDED CAREER

School	College Major	Intended Career
A	59.6	66.3
B	56.8	70.3
C	64.8	66.2
D	89.3	78.6
E	48.3	48.3
F	62.2	67.6
G	55.6	55.6
H	36.2	42.0
Mean	55.2	58.2

Differences there are, susceptible to interpretation of one's own choosing: the higher the degree of indecision the greater the young women's wisdom or the less good the career guidance. It is quite tempting to link school D's exceptionally high rate of indecision to its grading practices, giving the young women means of evaluating their differential effectiveness in various subjects.

PERCENT OF PARENTS WHO WANT THEIR DAUGHTERS TO AIM FOR A PARTICULAR JOB, BY SCHOOL

School	Father	Mother
A	6.8	10.2
B	16.2	16.2
C	22.5	32.9
D	21.4	7.1
E	33.1	36.2
F	18.9	32.4
G	16.7	27.8
H	21.7	21.7

School D seems systematically to give higher grades, irrespective of the subject matter. Conversely, the complaints of the students at School E of rugged competition and of not getting top grades no matter how hard they work, are understandable in light of the picture for these young women.

Not surprisingly, the fathers are best satisfied with the young women's grades at school D and least satisfied at E, C and F. Mothers are least satisfied with grades at schools G and E, best with B.

Science Related Activities and Work Experience were tallied as related to science-boundness for the schools and the distributions are roughly similar.

SCIENCE-BOUNDNESS AND SCIENCE RELATED ACTIVITIES AND WORK EXPERIENCE BY SCHOOL (IN PERCENT)

School	Total Sci.-Bound	Sci.-Related Activities	Sci.-Related Work Exp.
A	37.1	72.4	44.3
B	43.2	81.1	54.1
C	25.4	47.9	28.2
D	25.0	66.7	29.6
E	43.7	59.7	30.9
F	35.1	61.1	29.7
G	16.7	64.7	17.6
H	40.6	73.1	26.5
Mean	36.8	64.4	33.5

Whether offerings or encouragement for these experiences or the internal characteristics which cause the individuals to seek them come first, cannot of course be determined from these data. It may be that the schools or the communities in which they are located and the opportunities there afforded have some effect.

Overall, parents' specific career aims for their daughters are much less pronounced than those for educational level. By school, the trends for occupation resemble the parental ambitions for the young women's educational levels. The differences, however, are more conspicuous in relation to occupation, and would seem to constitute differences in permissiveness and perhaps in family relationships!

In case the school, or some component of it, might be an active agent in discouraging young women from science, technology and mathematics, the young women's open-ended statements were examined. Since merely 120 in toto responded, providing very small numbers in the cells, the comparisons cannot be regarded as very meaningful.

DISCOURAGEMENT FROM SCIENCE, RELATED TO BEING A YOUNG WOMAN, BY SCHOOL (IN PERCENT)

School	Much	Some	Total	Not Much	Not At All	Total
A	18.2	9.1	27.3	13.6	13.6	27.2
B	11.1	0	11.1	33.3	44.4	77.7
C	15.0	10.0	25.0	5.0	30.0	35.0
D	0	0	0	75.0	12.5	87.5
E	20.0	13.3	33.3	28.9	13.3	42.2
F	0	66.7	66.7	33.3	0	33.3
G	25.0	0	25.0	25.0	25.0	50.0
H	0	33.3	33.3	11.1	11.1	22.2
Mean	15.0	12.5	27.5	24.2	18.3	42.5

SUMMARY

To what degree the differences found between the schools reside in the administration, staff, policies, programs, pupil population, socio-economic-cultural aspects of the community or other contributing factors, can only be conjectured, especially while preserving the non-identification of the schools. To the extent that there are similarities, which in fact probably greatly override the differences, it again needs to be stressed that these schools all come from within a particular geographical area and are quite special in that each has a significantly sizeable college-going population.

Grading practice is one of the more easily measurable procedures. Extremes appear to be related to career decision making, in that easier grading gives students less opportunity to differentiate their capabilities (and perhaps reduces science-boundness), while hard grading promotes competitiveness and may serve as something of a discourager.

XV. SCHOOL STAFF RESPONSES

From the questionnaires returned by the eight secondary schools an attempt was made to compare reported data for three broad areas of concern, in order to determine whether these conditions were associated to any extent with the degree of science orientation of the students. The three areas chosen for this analysis were:

1. the number of course offerings in science and mathematics;

2. the qualifications of the teaching staff, roughly measured by objective data representing "paper" qualifications;

3. the student/counselor ratio and the reported functional distribution of counselor time.

COURSE OFFERINGS (By Semester Units)

School	Math	Science	Total	Ranking
A	23	25	48 H	(1)
B	14	12	26 L	(4)
C	28	16	44 H	(2)
D	19	-	-	-
E	16	26	42 H	(3)
F	-	18	-	-
G	10	8	18 L	(6)
H	15	10	25 L	(5)

Thus, it appears that schools A, C and E offer to their students the greatest range of courses in science and mathematics, and schools B, G and H the smallest. Data from schools D and F were incomplete, but judging from partial responses, they would probably have ranked at the middle of the range. The number and range of offerings do not parallel well the present science-boundness of young women: B, E and H have the highest percentages; C, D and G the lowest.

In order to make some rough comparisons of the "qualifications" of science and mathematics teachers in each of the eight schools, an analysis was made of the reported undergraduate and graduate majors pursued, whether they had experienced any continuing professional development in science or mathematics during the past four years, and whether they were teaching in the area of their major field of study.

"QUALIFICATIONS" OF SCIENCE AND MATH TEACHERS (By Percent)

School	Undergrad. Majors in Sci. or Math	Grad. Majors in Sci. or Math	Prof. Dev. in Last 4 Yrs. in Sci. or Math	Teaching in Major Field of Study
A	100 (1)	79 (3)	86 (2)	92 (2)
B	83 (3.5)	100 (1)	33 (5)	83 (4)
C	70 (6)	70 (5)	100 (1)	80 (5)
D	67 (7)	67 (6)	0 (7)	0 (7)
E	83 (3.5)	83 (2)	75 (3)	100 (1)
F	-	-	-	-
G	75 (5)	50 (7)	25 (6)	63 (6)
H	91 (2)	73 (4)	64 (4)	91 (3)

A composite ranking of these factors would place the schools in the following order:

1. School A
2. School E
3. School H
4. School B
5. School C
6. School G
7. School D

Viewing these rankings in combination with those on course offerings would indicate that schools A and E appear to offer the best environments for science-bound students. School C, which ranked high on course offerings, only placed fifth on the composite ranking of teacher "qualifications" but was highest on what may be a critical factor, that of recent continuing professional development in the field. However, it is relatively low in percentage of science-bound young women.

In reviewing the counseling and guidance program the student-counselor ratio was noted because a lower ratio should enable counselors to give more personal attention to individual students. They are as follows, in order of ranking:

School D - 235:1

School A - 249:1

School C - 266:1

School E - 372:1

School B - 381:1

School F - 407:1

School G - 428:1

School H - -

The following table arrays the estimates of how counselor time is distributed by major function in each school.

COUNSELOR FUNCTIONAL TIME DISTRIBUTION (By Percent)

Schools	Function						
	Programming	College Advising	Vocational Counseling	Testing	Personal Problems	Record Keeping	Other
A	35	15	10	1	20	15	6
B	20	10	10	5	25	15	5
C	50	10	5	1	20	10	1
D	30	20	8	-	10	30	2
E	15	45	2	1	25	10	2
F	25	15	15	5	25	10	5
G	55	8	10	0.5	15	9.5	2
H	-	-	-	-	-	-	-

For the seven schools reporting in total, the amount of counselor time devoted to vocational counseling averaged less than nine percent, well below programming (thirty-three percent); personal problems (twenty percent); college advising (eighteen percent); and record-keeping (fourteen percent). Most schools clustered fairly close to the averages, with the unique exception of E, which reported by far the lowest amount of vocational counseling (two percent) and by far the highest on college advising (forty-five percent).

School officials were asked to judge whether they considered the counseling and guidance program at their schools to be adequate, and to indicate reasons for inadequacies, if any. Only two of the schools (C and F) reported no dissatisfaction with the program. For the remainder, the reasons for inadequacies which were most heavily stressed were insufficient clerical support, the high student-counselor ratio and inadequate preparation of counselors for career guidance activities.

When asked whether the above shortcomings had special significance for young women who were potentially science oriented, two schools (A and E) responded affirmatively. Both urged greater emphasis in this area, better organization of information distribution and more in-service training of counselors. It is of interest to note that the two schools which by other measures appear to be the most favorable environments for science oriented young women, are the most self critical of their own counseling and guidance programs.

On the matter of occupational and guidance materials, four schools believed that the information maintained in their career centers was satisfactory and three (A, B, G) felt there were deficiencies in comprehensiveness or in the organization and distribution of information.

The most frequently used, and most useful, occupational information publications were ranked in the following order by the occupational information specialists of the respective schools:

1. Occupational Outlook Handbook and Occupational Outlook Quarterly ("Most comprehensive and reliable"; "extensive coverage and concise descriptions"; "current"; "future outlook"; "sources for additional information.")

2. California Occupational Guides ("Good practical information"; "focus on California, but limited by infrequent updating.")

3. Occupational Exploration Kit (SRA) ("Variety, brevity, students can experiment with different interests and see results.")

4. Encyclopedia of Careers (Ferguson).

5. Professional society publications ("Pertinent, graphic, interesting.")

Perceptions of school staff on employment prospects for women in science compared with those for men, the general outlook for these occupations and the factors which discourage or encourage women to pursue science careers, are treated separately for each school.

SCHOOL A

Employment Prospects

Twelve of the fourteen teachers responded to this question. Two indicated their belief that although conditions were improving they were still far from equal. Five expressed the view that prospects were equally good for women as for men, or that conditions were in balance, i.e., somewhat better for women in biology, mathematics, or teaching, but perhaps less good in engineering and computer sciences. Five believed that women definitely had an advantage over young men at the present time, principally due to affirmative action programs. Some resentment was expressed on this point, using the term "reverse discrimination."

Teacher evaluation of general labor market conditions tended to be contradictory. Some rated prospects in physics, chemistry and engineering as "good" and an equal number considered the outlook "fair" or "poor." Most consider prospects "good" in computer sciences and all were uniformly pessimistic on the teaching field.

Discouraging Factors

Three teachers indicated their belief that there were no discouraging factors. However, the vast majority indicated a number of conditions which resulted in negative attitudes on the part of young women to taking science and mathematics courses and considering careers in these fields. The most prevalent mentions were of parental attitudes, peer group pressures and stereotypes fostered by mass media which identified science and mathematics as "male provinces" and unsuitable for women. The lack of role models either in science teaching or in other science professions was mentioned twice. Two teachers indicated that the prospect of motherhood interfered with the ability of young women to plan for a lifetime of work. Two also blamed the prejudices of counselors or elementary school teachers for the negative attitudes of the young women towards careers in science, mathematics or technology. In discussing what efforts teachers could make to eliminate or reduce such discouraging factors, three suggested exposing young women to examples of successful women in science either through discussions, field trips or guest speakers. Three teachers suggested that efforts be made by teachers or counselors actively to recruit young women into science or mathematics courses. Two mentioned that discussions with students about the opening of employment opportunities would be useful.

Encouraging Factors

Prominent mention was made of the current community climate being very pro-women's liberation, stimulating young women to consider careers that had previously been regarded as predominantly masculine. Excellent job opportunities and related monetary rewards, brought about primarily by affirmative action programs, were also mentioned. The availability of an extensive curriculum in science as well as good teachers was also considered an encouraging factor. In discussing what effort teachers could make to enhance these encouraging factors, major mention was of eliminating discouragement by "treating females as prospective scientists rather than prospective housewives"; "treat with dignity and nature will take its course: develop classroom atmosphere and don't intimidate women." Again, mention was made of the importance of role models, using guest speakers in the classroom and making efforts to have more women teachers in science and mathematics departments. There was also the admonition that "cultural change takes a long time."

SCHOOL B

Employment Prospects

Only three of the six teachers responded to this question concerning the differences between prospects for men and women in science, mathematics and technology. One indicated there is not much difference, whereas the other two indicated that young women had better chances as paraprofessionals or as laboratory technologists, but not very good prospects in engineering, as an example.

In commenting about labor market prospects in general, staff were quite optimistic about all science and mathematical occupations except for teaching and engineering. The outlook for all health related fields was considered particularly favorable.

Discouraging Factors

Two referred to peer pressures and some residual negative public opinion that this (science) was "not the popular thing to do." The very tight job market and the cost of higher education as well as the difficulty of getting into medical or dental schools was mentioned by two teachers. On what efforts teachers could make to diminish these discouraging factors there were only two suggestions - to give recognition to outstanding science students (both men and women) and to emphasize equal opportunities in discussion with students.

Encouraging Factors

Prominent mention was made of the expanded availability of jobs in science, particularly in the health related fields, and the prestige, monetary rewards and the good working conditions associated with these occupations. The women's liberation movement was also noted as an encouraging factor by two teachers. The only suggestions regarding teacher efforts to enhance such factors were simply to encourage young women to take science and mathematics courses, to make known to them the expanding job opportunities and to stress the need for trained people.

SCHOOL C

Employment Prospects

Three of the ten teachers responding felt that the employment prospects were considerably less for women in science in comparison with men, and two others saw equal or slightly better than equal opportunity only for the teaching profession. One believed that chances were better for women in biology, but less favorable in other scientific or mathematical occupations. Three teachers referred to greater preference being given to women at this time particularly in government, teaching and large corporations, principally because of "reverse discrimination."

Views of general labor market conditions were somewhat contradictory. Counselors were, in the main, rather optimistic about prospects in all fields. Teachers were more ambivalent and generally less confident about the outlook, except in medicine.

Discouraging Factors

Three references were made to parental conditioning and social pressures, which leave students with the feeling that young women aren't good in math and science, resulting in a lack of interest to pursue mathematics courses. Two teachers referred to the expectation of marriage and motherhood ("the social and biological nesting instinct") which makes extensive preparation questionable in the minds of young women. One teacher pointed to existing employer bias and another to the lack of jobs in today's labor market as well as the cost of higher education, as being negative factors. As to efforts teachers can make to reduce these discouraging factors, mention was made of encouraging young women to develop their full potentials to seek careers in science and engineering, to stress that women can succeed in this field, and even with regard to those who have expectation of marriage, to point out that adequate training for a career is worth the effort for lifetime economic security.

Encouraging Factors

Again most prominent mention was made of recent publicity related to women's liberation which, together with affirmative action programs, has expanded the availability of jobs and monetary rewards possible for women.

Regarding teacher efforts to enhance such factors, the majority suggested that teachers could do more to encourage students to take science courses, to feel good about success and to stress the positive factors in the current climate. Three teachers suggested that nothing should be done, that "change should be natural" and that "more than enough is already being done."

SCHOOL D

Employment Prospects

Two of the three teachers responding to this question indicated that the prospects were improving and that women had a good chance, particularly for entry employment - although in the belief that advancement came faster for men.

Both teachers and counselors at this school viewed the labor market as good to excellent (perhaps unrealistically) for all occupations in science, mathematics and technology, including engineering.

Discouraging Factors

Two of the three teachers responding mentioned current economic conditions and tightness of the job market as negative influences on the young women's pursuit of science careers. On teacher efforts to diminish such discouraging factors, one suggested instilling more aggressive attitudes in young women to overcome traditional stereotypes, and another argued for a chance in school priorities giving greater importance to the "classroom versus football field."

Encouraging Factors

Mention was made of the preference for young women in employment brought about by affirmative action, as well as teachers' attitudes. The only suggestion for teacher efforts to enhance encouragement was to employ union activism to improve the quality of education and to provide for more female science and mathematics instructors.

SCHOOL E

Employment Prospects

One teacher referred to discrimination in many job categories, excepting only teaching. Three discerned no appreciable differences between men and women in prospects for employment. One felt that there were no differences in life sciences but there was still a residue of preference for men in the physical sciences. Two teachers expressed the belief that women had some advantage for entry employment at lower levels but that the opportunities for advancement for men were better. Two teachers indicated their belief for women because of affirmative action programs and "reverse discrimination."

Teachers and counselors alike were sanguine about labor market demands in most scientific, mathematical and engineering (except aerospace) occupations. Prospects in medical and medical related occupations were considered excellent; teaching was, of course, viewed as a poor opportunity.

Discouraging Factors

Fully half of the teachers expressed the belief that there were no such factors operating, and as one put it rather proudly, young women are "not discouraged here." One teacher pointed to the general unemployment situation and the knowledge that women are the least preferred as a discouraging condition. Five referred to family and societal ideas of the roles for men and women as creating fear in the minds of many young women of competing with young men, a fear of not succeeding in math or physics and a belief that they cannot achieve as well as men. Among the actions suggested for teachers to diminish these factors were efforts to encourage young women to pursue their talents and to take advanced placement courses in higher math or sciences and to convince them that intelligence and quantitative thinking are not related to sex chromosomes. One stressed the need for more occupational information and one argued that the only solution was to "change the whole western economic system."

Encouraging Factors

Significant comment was made here of conditions within the school that tend to encourage young women in science and math careers. Mentioned was the excellent instruction available, the fact that young women with ability get a great deal of encouragement and placement in honors classes, that advanced placement courses in higher math and science are open to all and that teachers' attitudes towards young women help direct them to explore all career fields. Also mentioned was the availability of top flight local universities and community interaction with the school, as well as good vocational guidance and the availability of work-study plans and part time jobs in the field. In discussing teacher efforts to enhance the encouraging factors, recommendations were made that more be done to counsel students to strive for excellence, to bolster their confidence through use of special assignments and to explain the opportunities for a meaningful life in science. Also mentioned was greater use of occupational and scholarship information. It was also suggested that teachers strive to obtain more scientific equipment, smaller classes and individualized instruction. One reference was made to the possibility of using monetary awards for the completion of courses.

SCHOOL F

Employment Prospects

Only three teachers (and no counselors) responded to the questionnaire at this school. They indicated a lack of knowledge about comparative opportunities for women. In terms of general labor market demand, only health career prospects were viewed as good to excellent.

Discouraging Factors

Mention was made of parental attitudes, the cultural idea that science is not a field for women and the current economic recession. To counteract these influences it was suggested that women be encouraged to continue their education and be provided with better information on opportunities and career choices.

Encouraging Factors

The achievements of prominent women and the trend toward equal rights for women were noted as favorable influences. It was suggested that teachers can help by bringing these development to the attention of young women.

SCHOOL G

Employment Prospects

Two teachers expressed the view that the prospects for women were poorer than for men, except in teaching and lab technology. Three indicated they believed there were no significant differences, while one stated his belief that many industries now prefer women. In general, labor market conditions were viewed to be good in engineering, computer science and medical fields, fair in mathematics and physics and poor in teaching.

Discouraging Factors

Four teachers felt either that there were no discouraging factors or did not respond to this question. Two referred to stereotyped thinking which stigmatizes scientific and technical occupations as unfeminine, leading young women to fear competition with males. One referred to the current job market as a discouraging factor and one blamed the poor job done by counselors. On possible teacher actions to diminish such discouraging factors there was reference to discussion with students of opportunities in science careers, and having women teachers in the field actually do the counseling of young women. One teacher recommended that they "stop harping on rights" and stress becoming qualified.

Encouraging Factors

Again, predominant mention was made here of expanding opportunities resulting from the liberalization of society and the national trends toward equality for women. Specific mention was made of the fact that half of the science department staff is female and this is an encouraging role model for the young women. The development of the Career Center which makes more occupational information available was also cited. On teacher efforts to enhance these factors mention was made of encouragement through class discussion and individual counseling and supporting the further development of the Career Center.

SCHOOL H

Employment Prospects

Four of the nine responding to this question believed that the advantages were still slightly in favor of men versus women in these fields. This included the belief that men get preference if they have families to support, and that while conditions for women are improving, there is still some bias among hiring personnel. Three teachers reported that they believed there were no differences between prospects for men and women. Two teachers expressed the view that the opportunities for women are excellent and better than for men, principally due to affirmative action programs at the present time.

General labor market conditions were viewed with skepticism by most teachers at this school. They considered opportunities in physics, engineering, mathematics and computer work as no more than fair, except for the most talented and best qualified.

Discouraging Factors

Three teachers referred to adult stereotypes, peer pressures and parental pressures against careers in science (i.e., "father doesn't want to see daughter doing the same thing he does"). Two teachers referred to the prospect of marital responsibilities as limiting the career choices of young women. Three teachers referred to the attitudes among young women themselves which militate against careers in science, such as not feeling aggressive enough to compete with men, or desiring work with people i.e., social activities, rather than work with machines. Two teachers could not identify any discouraging factors. As to actions the teachers can take to diminish these discouraging factors, the major mention was to provide more information to young women about expanding employment opportunities in scientific occupations. Two teachers also mentioned the desirability of closer contact with parents in order to influence their thinking.

Encouraging Factors

Prominent mention again was made here of the greatly enlarged opportunities for women coming out of the trends towards social equality. The existence of a Career Center at the school as well as the availability of scholarships and teacher-counselor encouragement were also mentioned. Suggested actions by teachers to enhance these factors can be summed up as a continuing encouragement of young women to make decisions not tied to past societal patterns, to bring more information to them about expanded employment opportunities and to encourage young women to make use of the Career Center. Two teachers expressed the view that special attention should not be given but rather this should be left to individual decisions.

XVI. SUMMARY AND CONCLUSIONS

This study involved 500 young women enrolled in their senior year in eight high schools in six San Francisco Bay Area Counties. These young women were selected for their aptitude in math and science, scoring in the upper twenty percent nationally on the Mathematics Section of the PSAT in 1973, or their junior year in high school. They were matched with 102 young men. Both groups were questionnaire surveyed and twenty-seven of the young women were interviewed. Questionnaire data were secured from the staffs of each of the secondary schools participating.

A composite criterion of science-boundness was developed and both the experimental and control groups were divided into science-bound and non-science-bound groups to determine insofar as possible factors encouraging and discouraging science direction for high science aptitude people.

Generally, these young women studied in this particular geographical area seem to have come a long way, with perhaps still some way to go. They are heavily career oriented, to the extent that only one single young woman suggests that among other options she may consider is that of a housewife. Of these young women seventy-six percent intend to work regularly in the future, too. Life style is considered of most importance in knowing about future careers, a shift from previous findings that occupational requirements were primary. Also, it is a sign of the times. Few attribute obstacles or deterrents to the fact that they are females and some have the opinion that by the time they are ready for employment in the science-math-technology fields their sex advantage will no longer be viable. Social attitudes are on the change!

Some basic psychological truisms, easy to lose sight of, are reinforced in this study. One is continuously impressed with the individual differences in the forces bearing upon personal development and choice. The myriad of interacting forces, influences, accidents constitute the confusing complexity which underlies the evolution for any individual of her, or his, destiny. The strands which can be extracted for viewing are not independent but are those which can perhaps be acted upon and may thus affect the whole to greater or lesser extent.

Another truism receiving abundant reinforcement in this study is that science and mathematics are not bound closely to each other in terms of interest and success; if not abilities. There are two axes on which they operate: from intense like of one and dislike of the other to the reverse, and intense like of both to dislike of both. Interest in science was expressed by sixty-seven percent, in math fifty-two percent. Among these young women approximately one-third are at this time science-technology-mathematics bound; only fifteen percent in present choices totally eliminated any consideration of science. With the known instability of choice at this stage, fluctuations may be expected in the future of these young women. Experience has shown that there is apt to be attrition in the college years. However, in this group, with practically forty percent undecided, accrual may also be expected.

There are significant differences within the four groups: Science, Science-Math, Math, and Other, and between the first three and the fourth. The young women who are into both Science and Math are the strongest in ability and perhaps in the assurance they will reach their objectives. The Science group is less interested or disinterested in Math, and the Math group returned the compliment for Science. Science-bound is much more the largest group, and shows preferences for biological sciences.

One interesting finding in contemporariness is the shying away from contemplation of teaching and eyeing of business administration.

There are general as well as special factors that affect in differing degrees the science-boundness of young women:

Ethnicity

Distinct differences exist between the Caucasian and Asian groups which accord with previous findings. A much higher proportion of Asian young women exists in the sample than would be expected in the population, and a higher proportion were science-bound, though not math-bound. The Asian young women expressed less disinterest in math and more intention of continuance in the study of mathematics. Over half of the Asian young women declare their intent to prepare for a future in Science, while only something over one-third of the Caucasian young women do so. Whether these differences are hereditary, cultural, environmental, they exist. As has elsewhere been indicated, recruitment of women into science in the Asian community should be profitable. In view of the lesser financial resources available to many able members of this group, increase of scholarships and other forms of financial aid especially designed for the encouragement of Asian young women for science at college undergraduate as well as graduate levels might well be considered.

Sex

Frequency of science-boundness is clearly greater for the young men, especially so for espousal of math. The young women are more likely to favor biological sciences. The young men's greater interest and strength in math appears in a number of contexts, from the distribution of PSAT scores on a national basis, to the higher scores of this group, to the stated intentions of continuing to take courses in math, and greater declaration of interest. Like the majority of findings in this study, this one is in accordance with the literature. Since the divergence between sexes increases with age, early attention to young women's arithmetic and mathematical affinity is, of course, indicated.

In the main, many similarities exist in attitudes, outlook and evaluation of their experiences. Few subjective statements speak positively to the major question: Are the problems, difficulties, and obstacles encountered by the young women sex-related, or conversely, is special encouragement received? Most responses of duplicate items are essentially similar with a few notable exceptions.

The question of sex differences in nurturance is professedly an open one. In this study of beginning senior year secondary school students, twenty-seven percent of the young women to one percent of the young men spontaneously expressed their intention of working with children.

A puzzling finding is that more of the young men's fathers are employed in physical science and technology occupations; more of the young women's in biological sciences. Since the groups were selected for aptitude rather than intended direction there is no suitable explanation immediately available and further research is suggested.

Community

Community and environmental factors have a bearing on the development of science-technology-math interests. Rich resources of a university town, or a large metropolitan area offer stimulation through lectures, demonstrations, extra high school courses, speakers available to the school, participatory voluntary and work experience activities. In a heavy industrial area, community mores encourage the image of and value for technology.

Because of the young women's overwhelming responses that they want, in the process of career development, to learn about occupations through their direct active experience - seeing, observing, hearing from people involved and trying out - schools might well be advised to amplify their efforts in behalf of their students to bring the community closer to them, and to be closer to it. In all communities resources are to be found, and the effective community may be larger than the school's district. Special attention could well be given to the science-technology-mathematics area in offering early and continuing opportunities for exposure and participatory activities.

Parents and Family

The parents of this study's especially capable young women are also superior, educationally and occupationally. Two-thirds of the mothers are currently employed. Unquestionably the parents are very important influences, especially the father, who is the more important in relation to science for the young women and even more so for the young men. It is the father to whom the child ordinarily turns early for help with homework in arithmetic and later in math, and his patience or impatience may be crucial in both attitudes and achievement subsequently.

The parents aspire high for these daughters, principally educationally. Interestingly, of those who have designs for them occupationally, it is the father who is apt to conceive of science areas, and it is more apt to be the mother who prefers female stereotypic roles for her daughter.

The family interests affect the early aspects of career development, often positively, sometimes negatively. The family's love of nature, value for mathematical processes, curiosity about causation has its impact, especially when it is implemented with communication, and with experiential outings. Occupations within science areas transmit directly.

Siblings, particularly older ones, are also influential.

Educational Practices

There is nothing particularly new in the findings in this area, but this study reaffirms the major significance of the educational experience in career development towards sciences.

A. Curriculum There are suggestions, particularly in the interviews, that the science curriculum prior to secondary school has not been well conceived. It appears to be haphazard in nature, with sporadic "units" of science introduced irregularly in the elementary school. The "general science" course, at least in this geographical area, varies considerably in relation to the particular interests and training of the teacher. It may concentrate on one aspect of science, or several, or treat all lightly. Unlike the majority of school subjects, there appears not to be an established sequence and exposure throughout. Attention might well focus on elementary-junior high school organized curricula, with study of optimal time and content presentation. It would appear that curricula in the secondary school can most profitably be expanded to include field experiences in the sciences studied, as e.g., rotating hospital internships.

B. Courses Courses were stated to be a major influence, ranking third. Continuous reference is made by the young women in the study to the content of their courses and the importance of the method by which material is presented. By these able young women discovery and full comprehension are preferred to rote, and they are attracted to appropriate content. Relative difficulty of math-science courses was frequently indicated and supported by differential grading for these top math-science aptitude students.

C. Teaching As is well known, teaching is crucial. Presentation of material, competence in grasp and communication, relating to students and their level is essential. The young women are aided in being attracted to math and science if they understand their relevance to the world and life, and their utility for the present and future. Bad experiences may sometimes be weathered. Sometimes poor teaching at a critical juncture turns the young woman away from math particularly, once and for all. Without an adequate "background" she may founder later even if she is willing to try. There is linkage in this study between strength of educational preparation of teachers and science-boundness by school. The sex of the teacher was rarely considered important but rather the competence regardless of sex. The science and science-math groups complain more about poor math and science teaching, especially of math before high school by the science group.

D. Grading Practices There is some evidence that grading practices may be related to career development of able students at either extreme. Too easy overall grading prevents the students from self-knowledge for self evaluation of abilities and interests and retards differentiation of fields. On the other hand, too stringent grading tends to discourage and prevent a realistic appraisal of knowledge and strengths. Social Science and English grades were higher for the science-bound group than their science and math grades, supporting their statements both of difficulty, and also the attraction of that difficulty.

E. Guidance Practices Notable is the young women's stress on self-activity in career development. Attention to enlargement of work experience opportunities in scientific areas would be of major help, as would be focussing on obtaining speakers for in-depth discussions with students. Arranging field trips in lieu of actual work experience might also be an increased function of the guidance program. Such experiences as these mentioned above are the preferred methods of evolving "own interests" and considered more helpful than hearing about careers from school personnel. It is rather notable that these young women rarely knew much about the school's Career Centers or expected their counselor to be helpful in career planning other than in college selection.

Attributes

Overwhelmingly and in every context, the young women attributed the greatest influence in career direction to their own interests and their own abilities. These, of course, have been in the process of being shaped by the plethora of factors mentioned, among others, and the complexity of their interaction. They are an achieving group, having grades which would admit all but five percent to the State University directly, and the others would be admissible on the CEEB. The young women's aspirations for their education were very high and in excess even of their parents' aspiration for them, and resembled their fathers' educational level. Their aspirations are far beyond those of their mothers for them.

These young women's ambitions are seen, too, in their evaluation of their scholastic achievements, professing greater dissatisfaction than the parents.

There are personality attributes which significantly distinguish the science-bound from non-science-bound in the case of the young women. These preferences are to:

-Solve puzzles and problems;

-Take things apart and see how they work;

-Do things that will improve society;

-Do things independently of others.

They indicate less preference for working with children than do non-science-bound young women. These particular findings suggest native factors as well as the external encouraging and discouraging ones.

Stability

As has been indicated throughout, there is considerable uncertainty about stability of choice or even direction at as early a stage as these young women and young men have been studied. Considering the extensiveness of the data accumulated concerning them, it would seem highly fruitful to follow these young women, particularly in their later exposures and experiences. The second year of college, the fourth less intensively, and the second or third thereafter would seem to be specially advantageous points at which to sink shafts: shafts of inquiry, testing, objective evaluation of course of action and performance, to be related to the data accumulated in this 1975 study.

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APPENDICES

A. PSAT ITEMS

B. INSTRUMENTS
  1. Questionnaire - F
  2. Questionnaire - M
  3. Basic Data
  4. Counseling & Guidance Program
  5. Occupational Information Specialist
  6. Work Coordinator
  7. Counselor
  8. Science Department
  9. Mathematics Department
  10. Teacher: Science or Mathematics Department

C. CLASSIFICATION SYSTEMS
  1. Science-Technology-Mathematics Educational Classification System
  2. Science-Technology-Mathematics Occupational Classification System

APPENDIX A

PSAT ITEMS

APPENDIX A

PSAT ITEMS

The Verbal Section: "contains four types of questions: antonyms, sentence completions, analogies, and reading comprehension."

For Math Section, see Chapter IV, Sample.

PSAT INSTRUCTIONS

PSAT/NMSQT administered October 23, 1973 instructions for items analyzed in this study:

Section 17

"In Section 17, 'Grade Average,' refer to your grid page from the Student Bulletin and blacken the oval that indicates your cumulative grade average. If you do not know the exact grade average, give your best estimate. This information will not affect your standing in any NMSC-administered scholarship programs..."

Sections 18 and 19

"For Sections 18 and 19 of your answer sheet, refer to your grid page. Transfer this information about your college major and career choices to the appropriate sections of the answer sheet, first by printing the code numbers in the boxes provided and then by blackening the corresponding ovals..."

COLLEGE MAJOR CODES

61	Accounting
62	Actuarial science
30	Advertising
70	Agriculture
50	Anthropology, archaeology
71	Architecture
41	Art (fine arts)
52	Art (graphic design)
21	Astronomy
63	Banking, finance
28	Biochemistry
53	Biological sciences (unspecified)
22	Biology
29	Biophysics
54	Botany
60	Business administration
23	Chemistry
55	Drama
56	Earth Sciences (unspecified)
57	Economics
48	Education (unspecified)
58	Art
59	Elementary
64	Music
66	Secondary
89	Special
10	Engineering (unspecified)
11	Aeronautical
67	Agricultural
12	Ceramic
13	Chemical
14	Civil, structural
15	Electrical
16	Industrial
17	Mechanical
18	Metallurgical
19	Mining
09	Petroleum
68	Science
42	English
72	Forestry
69	Geography
24	Geology
46	History
73	Home economics
74	Journalism
43	Languages (classical)
78	Languages (modern)
40	Liberal arts (unspecified)
75	Library science
79	Literature (comparative)
25	Mathematics, statistics

COLLEGE MAJOR CODES (Continued)

27	Meteorology
44	Music
34	Nursing
35	Occupational therapy
80	Oceanography
38	Pharmacy
45	Philosophy
76	Physical education
81	Physical sciences (unspecified)
36	Physical therapy
26	Physics
82	Physiology
83	Political science
32	Predentistry
84	Prelaw
31	Premedicine
39	Preoptometry
49	Psychology
87	Religion, theology
85	Religious education
20	Sciences (unspecified)
47	Social sciences (unspecified)
86	Sociology
77	Speech
33	Technology (medical, lab, dental)
65	Transportation studies
37	Veterinary science
88	Zoology
90	Undecided
99	Other

CAREER CHOICE CODES

61	Accountant
77	Actor, director
62	Actuary
29	Advertiser
30	Anthropologist, archaeologist
71	Architect
48	Artist (fine arts)
57	Artist (graphic design)
21	Astronomer
84	Banker, broker, financier
28	Biochemist
22	Biological scientist
55	Biophysicist
60	Business (management)
23	Chemist
56	City Planner
59	Computer systems work
32	Dentist
66	Economist
40	Educator, teacher (unspecified)
67	Administrator
68	Art
44	College
42	Elementary
69	Guidance counselor
80	Music
76	Physical education
45	Religious
43	Secondary
46	Special
10	Engineer (unspecified)
11	Aeronautical
82	Agricultural
12	Ceramic
13	Chemical
14	Civil, structural
15	Electrical
16	Industrial
17	Mechanical
18	Metallurgical
19	Mining
09	Petroleum
83	Science
78	Entertainer (radio, TV)
70	Farmer, rancher
72	Forester, conservationist
64	Geographer
24	Geologist
52	Government service, politician
85	Health fields (unspecified)
73	Home economist, dietician
63	Hotel and restaurant manager

CAREER CHOICE CODES (Continued)

86	Interior decorator
74	Journalist, writer
51	Lawyer
75	Librarian
47	Linguist, interpreter
25	Mathematician, statistician
33	Medical technologist
27	Meteorologist
79	Military
53	Minister, theologian, clergyman
58	Musician (except teacher)
34	Nurse
35	Occupational therapist
87	Oceanographer
39	Optometrist
88	Personnel work (industrial)
38	Pharmacist
89	Physical scientist
36	Physical therapist
31	Physician
26	Physicist
91	Physiologist
92	Political scientist
49	Psychologist
93	Sales representative
20	Scientist (unspecified)
94	Social scientist (unspecified)
95	Social worker
54	Sociologist
96	Speech therapist
65	Transportation (management)
37	Veterinarian
90	Undecided
99	Other

APPENDIX B - INSTRUMENTS

QUESTIONNAIRE - F

STUDENT QUESTIONNAIRE -- F

Date: ____________________ School: ________________

IDENTIFICATION

1. Name: ____

2. Date of birth: _________________________

3. Ethnic background as you identify yourself:

American Indian - Native American	☐
Black	☐
Caucasian	☐
Chicana or Latina	☐
Chinese	☐
Filipina	☐
Japanese	☐
Polynesian	☐

Other ethnic background ☐ specify: ______________________

Your replies on this questionnaire are CONFIDENTIAL and will be known only to CAREER PROJECTS personnel.

CAREER PROJECTS
2150 Shattuck Avenue, Suite 903
Berkeley, California 94704

FAMILY BACKGROUND

Many students have one or more step-parents. For purposes of this question and some of those following, please answer for your own parent.

1. Father's Education

Under Educational Attainment, check the highest level your own father reached (check only once). In the next column, please specify the major for each of your father's educational experiences beyond high school. Please complete this table even though your own father may not be living with you now.

OWN FATHER'S EDUCATION	Educational Attainment	Major
Grade school or some high school.....		
High school graduation..............		
Vocational training (as trade or business school)....................		
Some 4 yr. college or some junior college............................		
Junior or community college graduation..........................		
4 yr. college graduation............		
Some graduate or professional school..............................		
Higher graduate degree Masters (as MS; MA)............		
Doctorate (as Ph.D, D.Sc).......		
Professional (as medicine, law).		
Other highest attainment, specify: ____________		
Educated in foreign country.........		
Don't know..........................		

2. Mother's Education

Under Educational Attainment, please check the highest level your own mother reached (check only once). In the next column, please specify the major for each of your mother's educational experiences beyond high school. Please complete this table even though your own mother may not be living with you now.

OWN MOTHER'S EDUCATION	Educational Attainment	Major
Grade school or some high school.....		
High school graduation..............		
Vocational training (as trade or business school)....................		
Some 4 yr. college or some junior college...........................		
Junior or community college graduation.........................		
4 yr. college graduation............		
Some graduate or professional school.............................		
Higher graduate degree Masters (as MS; MA)............		
Doctorate (as Ph.D, D.Sc).......		
Professional (as medicine, law).		
Other highest attainment, specify: ______________________________		
Educated in foreign country.........		
Don't know..........................		

3. Parents' Occupation

Please give own parent's occupation even though he or she may be unemployed, retired or deceased. In such cases, describe his or her last occupation. If you are now living with a step-parent, in addition give his or her occupation.

Give sufficient detail in your answers to make the nature of your parents' occupations clear. Answers such as salesperson, manager, government worker, nurse or self-employed are not complete enough. Rather, describe the above more fully as salesperson-hardware, manager-supermarket, truck driver-naval base, licensed vocational nurse or self-employed engineering consultant.

a. Own father's occupation: ______________________________

____

b. Own mother's occupation: ______________________________

____

c. Step-father's occupation: ______________________________

____

d. Step-mother's occupation: ______________________________

____

4. Family Composition

Please give the number and describe the relationship to you of all the members of the household in which you are now living, for example, mother, step-father, legal guardian, grandmother, half brother, sister.

a. Number: ______ b. Relationship: ______________________

____

____

____

c. Please list below only your own full brothers and sisters whether or not they are now living with you.

	Brothers	Sisters
(1) Number older than you.............		
(2) Number younger than you...........		

COURSE PROGRAM

1. Course Program - Senior Year

Please enter below not only the courses you are now taking but also those you plan to take next semester:

This Semester		Next Semester	

2. Science and Mathematics Courses Taken Prior to this Semester

Please list all such courses by grade level as shown below:

Grade	Science		Mathematics	
11				
10				
9				
8				
7				

3. Grades

Please give your estimated grades on the average from the 9th through the 11th year.

a. English _____ Mathematics _____ Social Studies _____ Science _____

b. Estimated overall GPA without PE _______

ACTIVITIES

1. Please list any activities you have engaged in outside of school hours, for example, photography, music, camping, hospital volunteer.

____

____

2. List any clubs, groups or organizations you have belonged to, for example, science club, church group, Girl Scouts.

____

____

3. Describe any paid work experience you have had to date including after school, weekend, vacation and summer employment, for example, sales clerk in variety store, babysitting, file clerk in an architect's office, fruit picking.

____

____

PREFERENCES

1. Please indicate the degree to which you like to:

Preferences	Not at all	Very little	Some-what	Much	Very Much
Solve puzzles or problems.............					
Do things independently of others......					
Do well and accomplish................					
Have control over what you work on.....					
Put material in written form...........					
Analyze an idea or issue..............					
Help people...........................					
Take things apart to see how they work.					
Spend time with your family...........					
Study foreign languages...............					
Plan and organize what you do.........					
Be a leader...........................					
Receive recognition for what you do....					
Have others articulate issues or policies for you..................					
Have many friends.....................					
Do things that will improve society............................					
Draw, paint, or play an instrument.....					

EDUCATIONAL PLANS

1. In the boxes below, please check opposite the highest level of education you would like to attain in your lifetime (check only once):

Vocational training (as trade or business school) ☐

Some college education ☐

Junior or community college graduation ☐

4 yr. college graduation ☐

Some graduate or professional school ☐

Higher graduate degree

  Masters (as MS; MA) ☐

  Doctorate (as Ph.D; D.Sc) ☐

  Professional (as medicine or law) ☐

Other highest level, ☐ specify ______________________

Don't know ☐

2. Please check the type of college you most likely will first attend (check only once):

Junior or community college ☐

State college ☐

Private college, liberal arts ☐

Private college, other ☐

Women's college ☐

State university ☐

Private university ☐

Other type of college, ☐ specify ______________________

None ☐

3. If you plan to go to college, and if you have made a definite or tentative choice of a college major, please indicate this major on the line below. If you plan to enter college, but are not ready to specify a definite or tentative college major at this time, enter "undecided" on the line below.

College major: ______________________________

4. If you have written undecided on the line above, please list three majors you have thought about in the order they appeal to you.

a. ______________________

b. ______________________

c. ______________________

CAREER PLANS

1. If you have made a definite or tentative decision about your intended career, please indicate this career on the line below. If you have not arrived at a career decision, enter "undecided" on the line below.

Intended career: ____________________________________

2. If you have written undecided on the line above, please list three careers you have thought about in the order they appeal to you.

a. ____________________________________

b. ____________________________________

c. ____________________________________

3. Would your father like you to aim for a particular job or career? Yes ☐ No ☐

a. If "Yes", what job or career? ____________________

4. Would your mother like you to aim for a particular job or career? Yes ☐ No ☐

a. If "Yes", what job or career? ____________________

5. Would your father like you to aim for a particular level of education? Yes ☐ No ☐

6. Would your mother like you to aim for a particular level of education? Yes ☐ No ☐

7. If "Yes" to either or both questions 5 and 6 above, please check level in the appropriate column(s) below.

Level of Education	Father	Mother
Vocational training (as trade or business school).		
Some college education...........................		
Junior or community college graduation...........		
4 yr. college graduation.........................		
Some graduate or professional school.............		
Higher graduate degree Masters (as MS; MA).........................		
Doctorate (as Ph.D; D.Sc)...................		
Professional (as medicine or law)...........		
Other level of education, specify: ____________________________		

8. If marriage is included among your plans, please indicate below when you would like to be married (check only once).

Before you complete your education ☐
Immediately after you have completed your education ☐
After you have completed your education and been employed for a while ☐
Other time of marriage ☐ specify: ____________________
____
Don't know ☐

9. If you plan to work, please indicate below the length of time you would most like to be employed during your lifetime (check only once).

For a brief period before marriage ☐
For brief intervals throughout your life ☐
Part-time for the major part of your life:
  If not married ☐
  Together with being married - without children ☐
  Together with being married - with children ☐
Full-time for the major part of your life:
  If not married ☐
  Together with being married - without children ☐
  Together with being married - with children ☐
Other length of employment ☐ specify: ________________
____
Don't know ☐

10. If none of the above work/family arrangements is among your preferences, please specify your preference below:

____

____

EVALUATION OF EXPERIENCE

1. What was your reaction to your quantitative score percentile on the PSAT?

Higher than expected ☐ About as expected ☐ Lower than expected ☐

2. What is your estimate of your quantitative ability as compared with that of other students?

Very superior ☐
Superior ☐
Average ☐
Below average ☐

3. What was your reaction to your verbal score percentile on the PSAT?

Higher than expected ☐ About as expected ☐ Lower than expected ☐

4. What is your estimate of your verbal ability as compared with that of other students?

Very superior ☐
Superior ☐
Average ☐
Below average ☐

5. How do you feel about your high school grades?

Well satisfied ☐ Satisfied ☐ Not satisfied ☐

6. If you have checked not satisfied, please give your reasons.

____

____

____

7. How does your father feel about your high school grades?

Well satisfied ☐ Satisfied ☐ Not satisfied ☐

8. How does your mother feel about your high school grades?

Well satisfied ☐ Satisfied ☐ Not satisfied ☐

9. Please rank in the order of their importance to you those four items below which have most influenced you in your thinking about a career choice. Write 1 after your first selection of most important influences, and number your other selections from 2 through 4.

Activities ☐
Books and pamphlets about occupations ☐
Counselors ☐
Courses ☐
Father ☐
Financial considerations ☐
Grades ☐
Knowing someone in the occupation ☐
Mother ☐
Movie or TV programs ☐
Own abilities ☐
Own interests ☐
Own work experience ☐
Peers ☐
Physical capacity ☐
Relatives and older friends ☐
Teachers ☐
Other important influence ☐ specify: ______________________

____

a. Comments concerning influences on your career choice:

____

____

____

10. If you could find out anything you wanted to know about jobs or careers, what do you most want to know?

Please rank the four items most important to you in the order of their importance. Write 1 after your first choice, and number your other choices from 2 through 4.

Education and training needed for various jobs	☐
Skills and interests needed in various jobs	☐
Duties of various jobs	☐
Kind of life a person is likely to have with a certain job (hours worked, working conditions, possibility of travel, etc.)	☐
People with whom you would be working	☐
Wages or salary paid on job	☐
Chances for promotion in various jobs	☐
Kinds of jobs likely to be plentiful or hard to find in the future	☐
Location of jobs that interest you	☐

Other important information ☐ specify:______________________

____

11. In obtaining information about jobs or careers, how would you most like to get this information? Please rank in the order of their importance to you the three means of receiving information listed below that are most attractive to you. Write 1 after your first choice, and number your other choices 2 and 3.

Through talks with a counselor ☐
Through talks with a teacher ☐
In "world of work" courses describing many jobs ☐
In the content of your regular courses ☐
By reading about jobs in books and pamphlets ☐
By watching movies, film strips or TV ☐
Through attending a "Career Day" ☐
By actually seeing the work performed on various jobs ☐
By working part time or during vacations ☐
By engaging in activities that are job-related ☐
Through your parents and relatives ☐
Through people in the occupation ☐
By other important means ☐ specify: ____________________

____

12. Has any of the occupational information you have received to date significantly affected your career choice and/or your educational plans? Yes ☐ No ☐

13. If Yes to question 12, please describe:

a. The content of this information, for example: skills, interests or training needed for a specific job, wages, life style, security of employment. ____________________

____

____

b. The source of the above information, for example: pamphlets issued by an insurance company, talks with science teacher, working in a pharmacy last summer. ____________________

____

____

c. The result of receiving this information on your career choice and/or educational planning, for example: "influenced me tentatively to decide to be an architect so I am taking a course in drafting and also extra math". ____________________

____

____

SCIENCE-MATHEMATICS

As you know, you have been selected to participate in this survey because you have much more than the usual aptitude for Science and Mathematics as demonstrated on the PSAT. For that reason we believe that it is particularly important to obtain your further and more detailed evaluation of who or what has influenced you towards or away from these fields.

1. Please indicate the extent of your interest in mathematics by checking the boxes that apply to you.

Am not interested in mathematics	1 ☐
Am about as interested in mathematics as in all or most of my courses	2 ☐
Am more interested in mathematics than in most of my other courses	3 ☐
Plan to take more mathematics	4 ☐
Plan to take enough more mathematics to use as a tool or to constitute a major	5 ☐

If you have checked either box 1 or 2, please skip question 2, next page, and answer question 3, page after next.

If you have checked any or all of boxes 3 through 5, please answer question 2 on the next page, and skip question 3, page after next.

2. Please indicate the extent to which the following increased or encouraged your interest in the field of mathematics by checking under the appropriate heading opposite each listed item.

Item	Not at all	Moderately	Very much
Activities...........................			
Books and pamphlets about occupations.			
Counselors...........................			
Courses..............................			
Father...............................			
Financial considerations.............			
Grades...............................			
Knowing someone in the occupation.....			
Mother...............................			
Movie or TV program..................			
Own abilities........................			
Own interests........................			
Own work experience..................			
Peers................................			
Physical capacity....................			
Relatives and older friends..........			
Teachers.............................			
Other important influence, specify: ______________________			

3. Please indicate the extent to which the following decreased or discouraged your interest in the field of mathematics by checking under the appropriate heading opposite each listed item.

Item	Not at all	Moderately	Very much
Activities...........................			
Books and pamphlets about occupations.			
Counselors...........................			
Courses..............................			
Father...............................			
Financial considerations.............			
Grades...............................			
Knowing someone in the occupation.....			
Mother...............................			
Movie or TV program..................			
Own abilities........................			
Own interests........................			
Own work experience..................			
Peers................................			
Physical capacity....................			
Relatives and older friends..........			
Teachers.............................			
Other important influence, specify: ______________________			

4. Please indicate the extent of your interest in science by checking the boxes below that apply to you. (For purposes of this question, we are defining "science" as those courses other than mathematics which prepare one for careers in such areas as the physical, biological, and health sciences and in engineering.)

Am not interested in science	1 ☐
Am about as interested in science as in all or most of my courses	2 ☐
Am more interested in science than in most of my other courses	3 ☐
Plan to take more science	4 ☐
Plan to take enough additional science to qualify for an occupation in the field of science or in a related technology, or to constitute a major in science	5 ☐

If you have checked either box 1 or 2, please skip question 5, next page, and answer question 6, page after next.

If you have checked any or all of boxes 3 through 5, please answer question 5 on the next page, and skip question 6, page after next.

5. Please indicate the extent to which the following increased or encouraged your interest in the field of science by checking under the appropriate heading opposite each listed item.

Item	Not at all	Moderately	Very much
Activities..........................			
Books and pamphlets about occupations.			
Counselors..........................			
Courses.............................			
Father..............................			
Financial considerations............			
Grades..............................			
Knowing someone in the occupation.....			
Mother..............................			
Movie or TV program.................			
Own abilities.......................			
Own interests.......................			
Own work experience.................			
Peers...............................			
Physical capacity...................			
Relatives and older friends..........			
Teachers............................			
Other important influence, specify: ______________________			

6. Please indicate the extent to which the following decreased or discouraged your interest in the field of science by checking under the appropriate heading opposite each listed item.

Item	Not at all	Moderately	Very much
Activities...........................			
Books and pamphlets about occupations.			
Counselors...........................			
Courses..............................			
Father...............................			
Financial considerations.............			
Grades...............................			
Knowing someone in the occupation.....			
Mother...............................			
Movie or TV program..................			
Own abilities........................			
Own interests........................			
Own work experience..................			
Peers................................			
Physical capacity....................			
Relatives and older friends..........			
Teachers.............................			
Other important influence, specify: ______________________			

7. Overall, what experiences of any kind have you had that have tended to encourage you towards science and mathematics?

8. To what extent do you feel that any of these experiences was related to the fact that you are a girl?

9. Overall, what experiences of any kind have you had that have tended to discourage you from science and mathematics?

10. To what extent do you feel that any of these experiences was related to the fact that you are a girl?

11. Has this questionnaire, in itself, affected in any way your thinking about your educational and career planning? Yes ☐ No ☐

a. If Yes, how? ____

____

____

THANK YOU. WE VERY MUCH
APPRECIATE YOUR PARTICIPATION
AND COOPERATION.

APPENDIX B - INSTRUMENTS

QUESTIONNAIRE - M

STUDENT QUESTIONNAIRE -- M

Date: ____________________ School: ________________

IDENTIFICATION

1. Name: ____
2. Date of birth: _________________________
3. Ethnic background as you identify yourself:

American Indian - Native American ☐
Black ☐
Caucasian ☐
Chicano or Latino ☐
Chinese ☐
Filipino ☐
Japanese ☐
Polynesian ☐
Other ethnic background ☐ specify: ______________________

Your replies on this questionnaire are CONFIDENTIAL and will be known only to CAREER PROJECTS personnel.

CAREER PROJECTS
2150 Shattuck Avenue, Suite 903
Berkeley, California 94704

FAMILY BACKGROUND

1. Parents' Education

Under Educational Attainment, please check the highest level your own father and own mother reached (check only once). In the adjoining columns, specify the major for each of your parents' educational experiences beyond high school. Please complete this table even though your own father or mother may not be living with you now.

OWN PARENTS' EDUCATION	FATHER		MOTHER	
	Educational Attainment	Major	Educational Attainment	Major
Less than 4 year college graduation.................				
4 year college graduation...				
More than 4 year college graduation.................				

2. Parents' Occupation

Below, please give own parent's occupation even though he or she may be unemployed, retired or deceased. In such cases, describe his or her last occupation. If you are now living with a step-parent, in addition give his or her occupation.

Give sufficient detail in your answers to make the nature of your parents' occupations clear. Answers such as salesperson, manager, government worker, nurse or self-employed are not complete enough. Rather, describe the above more fully as salesperson-hardware, manager-supermarket, truck driver-naval base, licensed vocational nurse or self-employed engineering consultant.

a. Own father's occupation: ________________________________

____

b. Own mother's occupation: ________________________________

____

c. Step-father's occupation: ________________________________

____

d. Step-mother's occupation: ________________________________

____

COURSE PROGRAM

1. Course Program - Senior Year

Please enter below not only the courses you are now taking but also those you plan to take next semester:

This Semester		Next Semester	

2. Science and Mathematics Courses Taken Prior to this Semester

Please list all such courses by grade level as shown below:

Grade	Science		Mathematics	
11				
10				
9				
8				
7				

EVALUATION OF EXPERIENCE

1. What is your estimate of your quantitative ability as compared with that of other students?

Very superior ☐

Superior ☐

Average ☐

Below average ☐

2. What is your estimate of your verbal ability as compared with that of other students?

Very superior ☐

Superior ☐

Average ☐

Below average ☐

PREFERENCES

1. Please indicate the degree to which you like to:

Preferences	Not at all	Very little	Some-what	Much	Very Much
Solve puzzles or problems.............					
Do things independently of others......					
Do well and accomplish................					
Have control over what you work on.....					
Put material in written form...........					
Analyze an idea or issue..............					
Help people..........................					
Take things apart to see how they work.					
Spend time with your family...........					
Study foreign languages...............					
Plan and organize what you do.........					
Be a leader..........................					
Receive recognition for what you do....					
Have others articulate issues or policies for you..................					
Have many friends.....................					
Do things that will improve society..............................					
Draw, paint, or play an instrument.....					

EDUCATIONAL PLANS

1. If you plan to go to college, and if you have made a definite or tentative choice of a college major, please indicate this major on the line below. If you plan to enter college but are not ready to specify a definite or tentative college major at this time, enter "undecided" on the line below.

College major: ____

2. If you have written undecided on the line above, please list three majors you have thought about in the order they appeal to you.

a. ________________________________

b. ________________________________

c. ________________________________

CAREER PLANS

1. If you have made a definite or tentative decision about your intended career, please indicate this career on the line below. If you have not arrived at a career decision, enter "undecided" on the line below.

Intended career: ____

2. If you have written undecided on the line above, please list three careers you have thought about in the order they appeal to you.

a. ________________________________

b. ________________________________

c. ________________________________

9. Please rank in the order of their importance to you those four items below which have most influenced you in your thinking about a career choice. Write 1 after your first selection of most important influences, and number your other selections from 2 through 4.

- Activities ☐
- Books and pamphlets about occupations ☐
- Counselors ☐
- Courses ☐
- Father ☐
- Financial considerations ☐
- Grades ☐
- Knowing someone in the occupation ☐
- Mother ☐
- Movie or TV programs ☐
- Own abilities ☐
- Own interests ☐
- Own work experience ☐
- Peers ☐
- Physical capacity ☐
- Relatives and older friends ☐
- Teachers ☐
- Other important influence ☐ specify: ______________________________

____

a. Comments concerning influences on your career choice:

____

____

____

SCIENCE-MATHEMATICS

1. Please indicate the extent of your interest in mathematics by checking the boxes that apply to you.

Am not interested in mathematics	1 ☐
Am about as interested in mathematics as in all or most of my courses	2 ☐
Am more interested in mathematics than in most of my other courses	3 ☐
Plan to take more mathematics	4 ☐
Plan to take enough more mathematics to use as a tool or to constitute a major	5 ☐

2. Please indicate the extent of your interest in science by checking the boxes below that apply to you. (For purposes of this question, we are defining "science" as those courses other than mathematics which prepare one for careers in such areas as the physical, biological, and health sciences and in engineering.)

Am not interested in science	1 ☐
Am about as interested in science as in all or most of my courses	2 ☐
Am more interested in science than in most of my other courses	3 ☐
Plan to take more science	4 ☐
Plan to take enough additional science to qualify for an occupation in the field of science or in a related technology, or to constitute a major in science	5 ☐

3. Overall, what experiences of any kind have you had that have tended to encourage you towards science and mathematics?

4. Overall, what experiences of any kind have you had that have tended to discourage you from science and mathematics?

THANK YOU. WE VERY MUCH
APPRECIATE YOUR PARTICIPATION
AND COOPERATION.

APPENDIX B - INSTRUMENTS

BASIC DATA

CAREER PROJECTS, 2150 Shattuck Ave., Suite 903, Berkeley, California 94704

Date: ______________________ School: ______________________

BASIC DATA

1. TOTAL SCHOOL ENROLLMENT

If possible, please describe enrollment as of November 1, 1974.
If figures relate to other periods, specify dates under 1a and 2a below.

Total ________ Male ________ Female ________

Grade	Total	Male	Female
12th	____	____	____
11th	____	____	____
10th	____	____	____
9th	____	____	____

a. Date of above figures: ______________________

2. TOTAL SCHOOL ENROLLMENT BY ETHNIC GROUP

	Number
Total	____
American Indian	____
Black	____
Caucasian	____
Chicano or Latino	____
Chinese	____
Japanese	____
Other, specify:	____

____

____

____

a. Date of above figures: ______________________

3. JUNIOR CLASS ENROLLMENT - FALL 1973

Total __________ Male __________ Female __________

4. SENIOR CLASS ENROLLMENT - FALL 1974

If possible, please describe enrollment as of November 1, 1974.
If figures relate to another period, specify date under 4a below.

Total __________ Male __________ Female __________

Ethnic Group	Number
Total	______
American Indian	______
Black	______
Caucasian	______
Chicano or Latino	______
Chinese	______
Japanese	______
Other, specify:	______

____

____

____

a. Date: ____

5. PERIODS OF SCHOOL DAY

a. Number ____________________________________

b. Length ____________________________________

6. POST SECONDARY EDUCATION OF YOUR SCHOOL GRADUATES

	Number	Percent
a. All school graduates	____	100
College-going	____	____
To 4 yr college or university	____	____
To state college	____	____
To junior college	____	____

b. Period or date to which estimates relate ______________________

c. Source of estimates ______________________

____

____

____

7. NUMBER OF THE SCHOOL'S MERIT SCHOLARS AS A PERCENT OF THE GRADUATING CLASS IN 1973.

No. of Graduates	No. of Merit Scholars	Percent of Graduating Class
Total ______	______	______
Girls ______	______	______
Boys ______	______	______

8. PLEASE NOTE ANY AVAILABLE DATA THAT YOU BELIEVE PROVIDE INDICATORS OF THE SOCIO-ECONOMIC CHARACTERISTICS OF YOUR SCHOOL'S STUDENT POPULATION, FOR EXAMPLE, APPLICATIONS FOR EOP.

____

____

____

____

9. PLEASE DEFINE THE GEOGRAPHIC AREA FROM WHICH YOUR STUDENTS ARE DRAWN.

____

____

APPENDIX B - INSTRUMENTS

COUNSELING & GUIDANCE PROGRAM

CAREER PROJECTS
2150 Shattuck Ave., Suite 903
Berkeley, California 94704

Date: ______________________ School: ______________________

COUNSELING AND GUIDANCE PROGRAM

	Name	Title
1. Head Counselor:		

2. Number of certificated ________ and noncertificated personnel ________ now assigned to counseling activities.

a) ALL counselors for 10th through 12th grades:

Name	Per cent of time in counseling program	Assignment

Note: If you wish to extend your discussion of any question on this schedule, please use reverse side of page for additional comments.

b) Counseling staff in other professional or semi-professional activities who are engaged in counseling activities for 10th through 12th grades:

Title	Per cent of time in counseling program	Assignment

c) Number of clerical staff, full-time: _______; part-time: _______

d) Is the counseling staff supplemented by field placement students, volunteers, other agency personnel, etc.? Yes ☐ No ☐

e) If Yes, describe, giving their number, the per cent of their time spent in counseling and their assignments.

____

____

____

3. Usual counselor/student ratio of a full-time counselor __________

4. Your counseling department's work load is distributed among the functions below as follows:

Function	Per cent
Total	100.0
Programming	
College advising	
Vocational counseling or guidance	
Testing	
Personal counseling	
Referral to specialists	
Record keeping/clerical functions	
Maintenance of occupational guidance materials	
Other, describe:	

5. Counselors are assigned students as follows:

a) Grade level counseling

Counselor, regularly, for a given grade level, i.e., 11th grade ☐

Starts with students at school entry and retains them throughout ☐

Assigned randomly to grade level as needed ☐

Other means of assignment by grade level, describe: ☐

1) Within grade level, counselors are assigned:

By sex of student ☐

By alphabet segment ☐

Other, describe: ☐

____

____

b) Specialized counseling

If any counselor assignments are by function or particular target group, please describe amount and type of specialization.

____

____

____

6. Average number of contacts per student per year:

	Total	Required
10th grade	____	______
11th grade	____	______
12th grade	____	______

7. Names of tests regularly administered to all students:

9th ____

10th ____

11th ____

12th ____

a) Names of additional tests that may be used for vocational-educational counseling:

____

____

____

8. If these activities are available to your students, please indicate by whom administered and if their contribution to career guidance is significant.

	By whom administered?	Check if significant.
Career Center		☐
School Occupational Library		☐
Public Library - Occupational Section		☐
Career Guidance Courses		☐
Work Coordination		☐
Student Placement		☐
Career Days		☐
EOP		☐
Financial Aid		☐

Comments:

9. Whether or not the school occupational library is administered by the counseling department, please give its location within the school, and describe the way its contents are acquired and maintained.

10. Extent to which teachers contribute to career guidance activities through:

Including vocational information in course content ____________________

____

Contacts with individual students ____________________

____

Other, describe: ____________________

____

11. Estimated per cent of students at each grade level receiving career guidance other than programming and how these contacts are initiated:

Grade	PER CENT		
	Total	Counselor Initiated	Student Initiated
10th Grade	______	______	______
11th Grade	______	______	______
12th Grade	______	______	______

12. Describe the kinds of vocational counseling materials descriptive of the labor market (including audio-visual aids) that are available in this school for use in career guidance. ____________________

____

____

a) In the opinion of your counseling department, are these materials satisfactory for career guidance in general? Yes ☐ No ☐

b) If No, in what particulars are they unsatisfactory, and what improvements would you suggest? ____________________

____

____

____

c) In the opinion of your counseling department, are these materials satisfactory with particular reference to the counseling needs of girls who are highly capable of pursuing careers in science, mathematics, and technology? Yes ☐ No ☐

d) If No, in what particulars are they unsatisfactory, and what improvements would you suggest? ______________________________

____

____

____

13. In your opinion, is an adequate career guidance program, in general, offered in this school? Yes ☐ No ☐

If No, how would you number in order of their importance the following reasons for this inadequacy?

	Order of Importance
An excessive counselor/student ratio	☐
Insufficient clerical help for the counselors	☐
Insufficient amount and kinds of occupational information materials for use in career guidance	☐
Too much time required for administrative duties	☐
Too much time required for students' personal and social difficulties	☐
Inadequate testing program	☐
Inadequate liaison with or assistance from community so that such aids as "role models", Career Days, or employers available for contact are not available.	☐
Lack of preparation of counselors in career guidance	☐
Other, describe:	☐

____

____

____

a) Do any of the inadequacies mentioned above have specific significance for the effectiveness of the career guidance offered girls who are highly capable of pursuing careers in science, mathematics and technology?

Yes ☐ No ☐ If Yes, describe:

14. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in science, mathematics and technology from doing so?

a) Could the effects of any of these negative factors be diminished or eliminated through activities commonly carried on by counseling departments?

Yes ☐ No ☐

1) If Yes, how?

15. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science, mathematics and technology to do so?

a) Could the effects of any of these positive factors be enlarged through activities commonly carried on by counseling departments? Yes ☐ No ☐

1) If Yes, how?

APPENDIX B - INSTRUMENTS

OCCUPATIONAL INFORMATION SPECIALIST

CAREER PROJECTS
2150 Shattuck Ave., Suite 903
Berkeley, California 94704

Date: ______________________ School: ______________________

OCCUPATIONAL INFORMATION SPECIALIST

	Name	Title
1.	______________________	______________________

2. Please describe the amount and kinds of vocational counseling and guidance materials available in this school for use in career guidance.

____

____

____

____

____

____

a. Where are such materials located, and how are they maintained?

____

____

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____

3. Describe briefly the amount and kinds of audio-visual aids for use in career guidance available for your students.

____

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Note: If you wish to extend your discussion of any question on this schedule, Please use reverse side of page for additional comments.

4. Are there sources of information about careers outside of this school that are available to your students or to which they are directed (e.g., a "Career Center", the Municipal Library, a formalized employer contact program)?

Yes ☐ No ☐

a. If Yes, describe.

____

____

____

5. Of the published materials available in this school, which (in order of their value) do you consider the three most useful for career guidance in general?

Title	Author or Publisher
1.	
2.	
3.	

a. Why do you consider them the most useful?

____

____

____

6. Of the published materials available in this school, which (in order of their value) do you consider the three most useful for the career guidance of girls who are highly capable of pursuing careers in science, mathematics and technology?

Title	Author or Publisher
1.	
2.	
3.	

a. Why do you consider them the most useful?

____

____

____

7. Of the published career guidance materials available in this school, which three (in order of their use) do you believe the students consult most frequently?

Title — Author or Publisher

1. ____
2. ____
3. ____

8. From what individuals, organizations, or groups in your community do you receive information in other than published form which you regard as useful in career guidance in general? (List the information received in the order of its usefulness - 1, 2, 3 only.)

1. ____
2. ____
3. ____

9. From what individuals, organizations, or groups in your community do you receive information in other than published form which you regard as particularly useful in the career guidance of girls who are highly capable of pursuing careers in science, mathematics and technology? (List the information received in the order of its usefulness - 1, 2, 3 only).

1. ____
2. ____
3. ____

10. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in science, mathematics and technology from doing so?

____

____

____

a. Could the effects of any of these negative factors be diminished or eliminated through activities commonly carried on by occupational information specialists?

Yes ☐ No ☐

1) If Yes, how? ____________________________

____

____

11. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science, mathematics and technology to do so?

____

____

____

a. Could the effects of any of these positive factors be enlarged through activities commonly carried on by occupational information specialists?

Yes ☐ No ☐

1) If Yes, how? ____________________________

____

____

APPENDIX B - INSTRUMENTS

WORK COORDINATOR

REER PROJECTS, 2150 Shattuck Ave., Suite 903, Berkeley, California 94704

Date: ____________________ School: ____________________

WORK COORDINATOR

Name	Title
1. ____________________	____________________

2. Please list any of this school's vocational programs that combine work experience with course instruction:

3. In your opinion would it be advantageous for the student who is highly capable of pursuing a career in science, mathematics or technology to enroll in any of the above programs? Yes ☐ No ☐

   a. If Yes, in which and for what reasons?

4. Have any girls whom you would consider highly capable of pursuing a career in science, mathematics or technology enrolled in the programs listed under 3 above? Yes ☐ No ☐

   a. If Yes, in which?

   b. If No, in your opinion why have they not enrolled?

Note: If you wish to extend your discussion of any question on this schedule, please use reverse side of page for additional comments.

5. If, in your opinion, it would be advantageous for girls who are highly capable of pursuing a career in science, mathematics or technology to enroll in programs that combine work experience with course instruction:

   a. What types of programs do you believe should be developed for this purpose? ______________________________

   ____

   ____

   b. What difficulties would you foresee as impeding development of such programs as the above? (Please check below, or otherwise indicate, factors which you believe would constitute major problems.)

      1) The administrative problems and expense of developing any work experience program ☐

      2) Employer resistance against hiring girls for the programs you suggest ☐

      3) Lack of appeal of the suggested programs for girls ☐

      4) Other difficulties, describe: ☐

   ____

   ____

   ____

   ____

6. If this school maintains a placement service, please describe the service indicating the qualifications and activities of the person(s) maintaining it.

   ____

   ____

   ____

a. If it does not, what placement services are offered students seeking part-time,temporary or vacation jobs, and how would you describe the adequacy of these services? ________________________________

____

____

____

b. What placement services are offered students seeking career-type jobs, and how would you describe the adequacy of these services? ________

____

____

____

7. In your opinion does the situation you have described above have any special implications (favorable or unfavorable) for the career development of students who are highly capable of pursuing careers in science, mathematics, or technology? Yes ☐ No ☐ Why? ________________

____

____

a. If these implications are appreciably different for such girls as compared with boys of equal capability, please explain. __________

____

____

____

8. Within the past five years, have you or, to your knowledge, has this school district conducted a one-time or continuing survey of immediate job opportunities available in this community? Yes ☐ No ☐

a. If Yes, please describe, noting if occupations in science, mathematics and technology were included. ______________________________

____

9. Within the past five years, have you or, to your knowledge, has this school district conducted a one-time or continuing study of the long-range job outlook in this community? Yes ☐ No ☐

   a. If Yes, please describe, noting if occupations in science, mathematics and technology were included. ______________________________

   ____

   ____

10. Are there person(s) in this school who regularly maintain liaison with employers and others in the outside community who supply information or services that you believe to be of value to career guidance or student placement? (e.g., employment projections, provision of role models, support for career days) Yes ☐ No ☐

    a. If Yes, please give names and titles of these school person(s), the types of individuals or groups they contact, and the information or services that are provided. ______________________________

    ____

    ____

11. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in science, mathematics or technology from doing so? ________________

    ____

    ____

a. Could the effects of any of these negative factors be diminished or eliminated through activities commonly carried on by work coordinators or influences they could exert? Yes ☐ No ☐

1) If Yes, how? ____________________

12. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science, mathematics or technology to do so? ____________________

a. Could the effects of any of these positive factors be enlarged through activities commonly carried on by work coordinators or influences they could exert? Yes ☐ No ☐

1) If Yes, how? ____________________

APPENDIX B - INSTRUMENTS

COUNSELOR

CAREER PROJECTS
2150 Shattuck Ave., Suite 903
Berkeley, California 94704

Date: ____________________ School: ____________________

Counselor

1. Name: ____________________________________

2. If in your experience you have found that special factors are involved in counseling students who are highly capable of pursuing careers in science, mathematics and technology, please describe:

    a. Are these factors significantly different for girls?

    Yes ☐ No ☐

    1) If Yes, describe:

3. What is your perception of the current local and also the broader labor market for recent college graduates in the sciences, mathematics, or technology? Please describe below in terms of such specific occupations (e.g., physicist, applied mathematician, engineer) as you may wish to mention.

Selected Occupation	Current Employment Prospects

Note: If you wish to extend your discussion of any questions on this schedule, please use reverse side of page for additional comments.

a. If you believe that employment prospects and chances for career success in the above selected occupations differ appreciably for young women as compared with those for young men, please give your impression of the situation by occupation.

4. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in science, mathematics or technology from doing so?

a. Could the effects of any of these negative factors be diminished or eliminated through the activities commonly carried on by counselors?

Yes ☐ No ☐

1) If Yes, how?

5. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science, mathematics or technology from doing so?

a. Could the effects of any of these positive factors be enlarged through th[illegible]tivities commonly carried on by counselors?

Yes ☐ No ☐

1) If Yes, how?

____

____

____

APPENDIX B - INSTRUMENTS

SCIENCE DEPARTMENT

CAREER PROJECTS
2150 Shattuck Ave., Suite 903
Berkeley, California 94704

Date: ____________________ School: ____________________

SCIENCE DEPARTMENT

	Name	**Title**
1. Department head:		

2. Please describe briefly the way your department is organized and functions.

3. How many total units or semester periods of science are required for graduation?

   a. Please list by titles the sequence of courses that are required in your department.

      1) For high school graduation:

      2) For the typically rapid learner:

Note: If you wish to extend your discussion of any question on this schedule, please use reverse side of page for additional comments.

4. In your opinion, are there significant differences between the attrition rates of girls and boys, who are highly capable of pursuing careers in science or technology, as they move through the normal course sequence?

Yes ☐ No ☐

a. If Yes, please describe by giving any quantitative data you may have and by indicating the courses involved.

b. If Yes, what in your opinion accounts for differences in the attrition rates of boys and girls?

5. How does your department provide for the special needs, special interests, and varying abilities of students?

a. If anything in particular is provided for girls who are highly capable of pursuing careers in science or technology, please describe: (e.g., encouragement to take additional courses, use of role models, referral to special courses outside the school, involvement of community groups or appropriate individuals in their career guidance).

6. Please describe any follow-up studies of your former students regarding these students' college achievement and/or subsequent career choice and career success.

a. If such information is available, please describe the career choices and progress of those girls who showed evidence of being highly capable of pursuing careers in science or technology while enrolled in high school.

7. What is your perception of the current local and also the broader labor market for recent college majors in the fields taught in your department (e.g., physicist, chemist, biologist)?

Selected Occupation	Current Employment Prospects

a. If you believe that employment prospects and chances for career success in the above selected occupations differ appreciably for young women as compared with those for young men, please give your impressions of the situation by occupation.

8. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in science or technology from doing so?

a. Could the effects of any of these negative factors be diminished or eliminated through the activities commonly carried on by science departments?

Yes ☐ No ☐

1) If Yes, how?

____

____

____

9. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science or technology to do so?

____

____

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a. Could the effects of these positive factors be enlarged through the activities commonly carried on by science departments? Yes ☐ No ☐

1) If Yes, how?

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____

____

10. Please attach any documents, lists, brochures, etc., that will describe the total course offerings of your department.

APPENDIX B - INSTRUMENTS

MATHEMATICS DEPARTMENT

CAREER PROJECTS
2150 Shattuck Ave., Suite 903
Berkeley, California 94704

Date: ______________________ School: ______________________

MATHEMATICS DEPARTMENT

	Name	Title
1. Department head:	______________________	______________________

2. Please describe briefly the way your department is organized and functions.

____

____

____

____

3. How many total units or semester periods of mathematics are required for graduation?

   a. Please list by titles the sequence of courses that are required in your department.

      1) For high school graduation:

      ______________________ ______________________

      ______________________ ______________________

      ______________________ ______________________

      ______________________ ______________________

      2) For the typically rapid learner:

      ______________________ ______________________

      ______________________ ______________________

      ______________________ ______________________

      ______________________ ______________________

Note: If you wish to extend your discussion of any question on this schedule, please use reverse side of page for additional comments.

4. In your opinion, are there significant differences between the attrition rates of girls and boys, who are highly capable of pursuing careers in mathematics, as they move through the normal course sequence?

   Yes ☐ No ☐

   a. If Yes, please describe by giving any quantitative data you may have and by indicating the courses involved.

   b. If Yes, what in your opinion accounts for differences in the attrition rates of boys and girls?

5. How does your department provide for the special needs, special interests, and varying abilities of students?

a. If anything in particular is provided for girls who are highly capable of pursuing careers in mathematics, please describe: (e.g., encouragement to take additional courses, use of role models, referral to special courses outside the school, involvement of community groups or appropriate individuals in their career guidance).

6. Please describe any follow-up studies of your former students regarding these students' college achievement and/or subsequent career choice and career success.

a. If such information is available, please describe the career choices and progress of those girls who showed evidence of being highly capable of pursuing careers in mathematics while enrolled in high school.

7. What is your perception of the current local and also the broader labor market for recent college majors in mathematics (e.g., "pure" mathematician or applied mathematician) or in fields for which a facility in mathematics is essential (e.g., engineer)?

Selected Occupation	Current Employment Prospects

a. If you believe that employment prospects and chances for career success in the above selected occupations differ appreciably for young women as compared with those for young men, please give your impressions of the situation by occupation.

8. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in mathematics from doing so?

a. Could the effects of any of these negative factors be diminished or eliminated through the activities commonly carried on by mathematics departments? Yes ☐ No ☐

1) If Yes, how?

____

____

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9. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science or technology to do so?

____

____

____

a. Could the effects of these positive factors be enlarged through the activities commonly carried on by mathematics departments? Yes ☐ No ☐

1) If Yes, how?

____

____

____

10. Please attach any documents, lists, brochures, etc., that will describe the total course offerings of your department.

APPENDIX B - INSTRUMENTS

TEACHER: SCIENCE OR MATHEMATICS DEPARTMENT

Date: ____________________ School: ____________________

TEACHER: SCIENCE OR MATHEMATICS DEPARTMENT

1. Name: ____________________ Position or field: ____________________

2. Preparation

a. Undergraduate

Institution	Degree	Date	Major	Minor

b. Graduate

Institution	Degree or Credential	Date	Major	Minor

3. Professional development over last four years

	Institution	Description
College courses		
College summer sessions		
Workshops (2 or more days)		
Extension courses		
Work experience (if credit allowed)		
Travel (if credit allowed)		

Note: If you wish to extend your discussion of any question on this schedule, please use reverse side of page for additional comments.

4. Membership in professional organizations:

Organization	Offices held, if any

5. Honors, awards, publications, etc. (Describe.)

6. Courses taught: last four years.

7. What is your perception of the current local and also the broader labor market for recent college graduates with majors in the field(s) you are teaching (e.g., physicist, mathematician) or in occupations for which this field furnishes a partial preparation (e.g., engineer)?

Selected Occupation	Current Employment Prospects

a. If you believe that employment prospects and chances for career success in the above selected occupations differ appreciably for young women as compared with those for young men, please give your impressions of the situation by occupation.

8. In your opinion, what are the chief factors, now operative, that would tend to discourage this school's girls who are highly capable of pursuing careers in science, mathematics or technology from doing so?

a. Could the effects of any of these negative factors be diminished or eliminated through efforts that could be made by teachers in your field?

Yes ☑ No ☐

1) If Yes, how?

9. In your opinion, what are the chief factors, now operative, that would tend to encourage this school's girls who are highly capable of pursuing careers in science, mathematics or technology to do so?

a. Could the effects of any of these positive factors be enlarged through efforts that could be made by teachers in your field?

Yes ☐ No ☐

1) If Yes, how?

____

____

____

CAREER PROJECTS
2150 Shattuck Ave., Suite 903
Berkeley, California 94704

APPENDIX C - CLASSIFICATION SYSTEMS

SCIENCE-TECHNOLOGY-MATHEMATICS

EDUCATIONAL CLASSIFICATION SYSTEM

SCIENCE-TECHNOLOGY-MATHEMATICS
EDUCATIONAL CLASSIFICATION SYSTEM

Level of Attainment

	CODE
Grade school or some high school	00
High school graduation	01
Vocational training (e.g., trade or business school apprenticeship, secondary vocational education, proprietary school, etc.)	02
Some four-year college or some junior college	03
Junior or community college graduation	04
Less than four-year college graduation	05
Four-year college graduation	06
Some graduate or professional school	07
Higher graduate degree, other than below:	09
Masters (as M.S., M.A.)	10
Doctorate (as Ph.D., D.Sc.)	11
Professional (as M.D., J.D.)	12
More than four-year college graduation	13
Other highest attainment	91
Foreign	92
Undecided	96

Major

PSAT#		CODE
	Science Majors--Plants, Animals and related Life Sciences	0
67	Agricultural engineering	0001
70	Agriculture	0002
53	Biological sciences, unspecified	0003
22	Biology	0004
54	Botany	0005
	Education, Secondary--Plants, Animals and related Life Sciences	0006
	Education, College--Plants, Animals and related Life Sciences	0007
	Environmental science	0008
72	Forestry	0010
	Landscape architecture	0011
80	Oceanography	0012
	Paleontology	0013
37	Veterinary science	0014
88	Zoology	0015
	Entomology	0016
	Other science majors--Plants, Animals and related Life Sciences	0019

Major fields related to Plants, Animals and related Life Sciences at the technical or technological level--as in trade, business, and proprietary schools; government, military, secondary school and JC vocational education; apprenticeship and other OJT.	0
Training in agricultural and horticultural occupations	0024
Training in animal care occupations	0025
Training in "environmental" occupations	0026
Other Field 0 training	0029

PSAT #		CODE
	Science Majors--Human, Medical and related Life Sciences	1
	Education, Secondary--Plants, Animals and related Life Sciences	1027
	Education, College--Plants, Animals and related Life Sciences	1028
73	Home economics (dietician)	1030
34	Nursing	1031
35	Occupational Therapy	1032
38	Pharmacy	1033
36	Physical Therapy	1034
82	Physiology	1035
32	Predentistry	1036
31	Premedicine	1037
39	Preoptometry	1038
49	Psychology	1040
33	Technology (medical, lab, dental)	1041
	Bacteriology	1042
	Public health	1043
	Speech therapy, audiology	1044
	Child development	1045
	Human development	1046
	Other science majors--Human, Medical and related Life Sciences	1049

Major fields related to Human, Medical and related Life Sciences at the technical or technological level--as in trade, business, and proprietary schools; government, military, secondary school and JC vocational education; apprenticeship and other OJT.	1
Technology (medical, lab, dental--at semi-professional level)	1054
Dental hygienist training	1055
LVN training	1056
Other Field 1 training	1059

PSAT #		CODE
	Science Majors--Physical Sciences	2
21	Astronomy	2064
28	Biochemistry	2065
29	Biophysics	2066
23	Chemistry	2067
56	Earth sciences, unspecified	2068
	Education, Secondary--Physical Sciences	2070
	Education, College--Physical Sciences	2071
69	Geography	2072
24	Geology	2073
27	Meteorology	2074
81	Physical sciences, unspecified	2075
26	Physics	2076
20	Science, unspecified	2077

Major fields related to the Physical Sciences at the technical or technological level--as in trade, business, and proprietary schools; government, military, secondary school and JC vocational education; apprenticeship and other OJT.	2
Field 2 training	2089

PSAT #		CODE
	Engineering and Architecture Majors	3
71	Architecture	3094
	Education, Secondary--Engineering and Architecture	3095
	Education, College--Engineering and Architecture	3096
	Engineering:	
11	Aeronautical	3097
12	Ceramic	3098
13	Chemical	3100
14	Civil, structural	3101
15	Electrical, electronics	3102
83	Engineering, science	3103
16	Industrial	3104
17	Mechanical	3105
18	Metallurgical	3106
19	Mining	3107
09	Petroleum	3108
10	Engineering, unspecified	3110
	Other engineering and architecture majors	3119

Major fields related to Engineering and Architecture at the technical or technological level--as in trade, business and proprietary schools; government, military, secondary school or JC vocational education; apprenticeship and other OJT.	3
Surveying course	3124
Engineering aids training (drafting)	3125
Electronics technician	3126
Other Field 3 training	3129

PSAT #		CODE
	Mathematics, Statistics and Computer Science	4
62	Actuarial science	4134
	Computer science	4135
	Education, Secondary--Mathematics, Statistics, Computer Science	4136
	Education, College--Mathematics, Statistics, Computer Science	4137
25	Mathematics, Statistics	4138
	Other majors--Mathematics, Statistics, Computer Science	4139

Major fields related to Mathematics, Statistics and Computer Science at the technical or technological level--as in trade, business, and proprietary schools; government, military, secondary school or JC vocational education; apprenticeship and other OJT.	4
Computer technology courses	4144
Other Field 4 training	4149

PSAT #		CODE
	Majors having Scientific-Technical-Mathematical Aspects	5
61	Accounting	5154
60	Business administration	5155
	Education, Secondary--Science-Tech-Math Aspects exc PE & Special	5156
	Education, College--Science-Tech-Math Aspects exc PE & Special	5157
76	Education, Secondary or College--Physical education	5158
89	Education, Secondary or College--Special education	5160
65	Transportation studies	5161
	Other majors having Scientific-Technical-Mathematical aspects	5169

	Major fields having Scientific-Technical Mathematical aspects at the technical or technological level--as in trade, business, and proprietary schools; government, military, secondary school or JC vocational education; apprenticeship and other OJT.	5
	Management courses	
	Scientific-technical-mathematical activity	5174
	Sales courses	
	Scientific-technical-mathematical activity	5175
	Craft training; apprenticeship	
	Scientific-technical-mathematical related occupations	5176
	Training for Service Occupations IF scientific-tech-math related:	
	Dental Assistant	5177
	Nurse Aid; Orderly	5178
	Other sci-tech-math related training for service occupations	5179
	Training for clerical or "business" occupations IF sci-tech-math related:	
	Medical secretary	5184
	Accounting	5185
	Other sci-tech-math related training for clerical occupations	5189

PSAT #	Non-Scientific-Technical-Mathematical Majors	CODE 8
50	Anthropology, archeology	8194
57	Economics	8195
83	Political science	8196
46	History	8197
86	Sociology	8198
47	Social sciences, unspecified	8200
	Social welfare	8201
	Public administration	8202
	Counseling (guidance)	8203
	Other social sciences	8209
41	Art (fine arts)	8214
52	Art (graphic, design)	8215
55	Drama	8216
42	English	8217
74	Journalism	8218
43	Languages (classical)	8220
78	Languages (modern)	8221
79	Literature (comparative)	8223
44	Music	8224
45	Philosophy	8225
87	Religion, theology	8226
77	Speech	8227
40	Liberal arts (unspecified)	8228
	Other arts and humanities	8229
30	Advertising	8234
63	Banking, finance	8235
75	Library science	8236
84	Prelaw	8237
	Other non-scientific-technical-mathematical majors	8239

PSAT #		CODE
	Education, preschool	8244
59	Education, elementary, unspecified	8245
66	Education, secondary, unspecified	8246
	Education, secondary, non-sci-tech-math, exc art or music	8247
	Education, college, unspecified	8248
	Education, college, non-sci-tech-math, exc art or music	8250
58	Education, Art--secondary, college, private	8251
64	Education, Music--secondary, college, private	8252
85	Education, Religious	8253
48	Education, unspecified	8254

Major fields that are not related to Scientific-Technical-Mathematical fields (or that have no aspects of these fields) as in trade, business, and proprietary schools; government, military, secondary school or JC vocational education; apprenticeship and other OJT.	8
Management courses	
Non-scientific-technical-mathematical activity	8255
Sales courses	
Non-scientific-technical-mathematical activity	5175
Craft training; apprenticeship	
Non-scientific-technical-mathematical craft	8257
Training for Service Occupations IF non-sci-tech-math related:	
Airline stewardess	8258
Hairdresser, barber	8260
Fire protection	8261
Police protection	8262
Military	8263
Other non-sci-tech-math related training for service occupations	8269
Training for clerical or "business" occupations IF non-sci-tech-math related:	
Secretarial, typing	8274
Office machines	8275
Other Field 8 training for clerical occupations	8279

PSAT #		CODE
99	Other	9999
	Foreign	9222
90	Undecided	9666

APPENDIX C - CLASSIFICATION SYSTEMS

SCIENCE-TECHNOLOGY-MATHEMATICS

OCCUPATIONAL CLASSIFICATION SYSTEM

SCIENCE-TECHNOLOGY-MATHEMATICS
OCCUPATIONAL CLASSIFICATION SYSTEM

PSAT #		CODE
	PROFESSIONAL WORKERS	0
	Scientists -- Plants, Animals and related Life Sciences	00
82	Agricultural Engineer	00001
	Agricultural Scientist	00002
22	Biological Scientist	00003
	Botanist	00004
72	Forester, conservationist	00005
	Landscape architect	00006
87	Oceanographer	00007
	Paleontologist	00008
	Teacher, Secondary--Plants, Animals and related Life Sciences	00010
	Teacher, College--Plants, Animals and related Life Sciences	00011
37	Veterinarian	00012
	Entomologist	00013
	Horticulturist	00014
	Soil Scientist	00015
	Environmentalist	00016
	Other Scientists--Plants, Animals and related Life Sciences	00019
	Scientists and Practitioners--Human, Medical and related Life Sciences	01
	Chiropractor	01020
32	Dentist	01021
73	Dietician/Home economist	01022
39	Optometrist	01023
38	Pharmacist	01024
31	Physician	01025
91	Physiologist	01026
	Podiatrist	01027
	Psychiatrist	01028
49	Psychologist	01030
34	(Registered) Nurse	01031
	Teacher, Secondary--Human, Medical and related Life Sciences	01032
	Teacher, College--Human, Medical and related Life Sciences	01033
35	Therapist, Occupational	01034
36	Therapist, Physical	01035
96	Therapist, Speech	01036
	Other Scientists and Practitioners--Human, Medical and related Life Sciences	01049

PSAT #		CODE
	Scientists--Physical Sciences	02
21	Astronomer	02050
28	Biochemist	02051
55	Biophysicist	02052
23	Chemist	02053
64	Geographer	02054
24	Geologist	02055
27	Meteorologist	02056
26	Physicist	02057
89	Physical scientist, unspecified	02058
20	Scientist, unspecified	02060
	Teacher, Secondary--Physical Science	02061
	Teacher, College--Physical Science	02062
	Other physical scientists	02069
	Engineers and Architects	03
71	Architect	03070
	Engineer:	
11	Aeronautical	03071
12	Ceramic	03072
13	Chemical	03073
14	Civil, structural	03074
15	Electrical	03075
16	Industrial	03076
17	Mechanical	03077
18	Metallurgical	03078
19	Mining	03080
09	Petroleum	03081
83	Science (engineer)	03082
10	Unspecified (engineer)	03083
	Teacher, Secondary--Engineering and Architecture (e.g., drafting)	03084
	Teacher, College--Engineering and Architecture	03085
	Other technical engineers and related	03089

APPENDIX B - INSTRUMENTS

BASIC DATA

CAREER PROJECTS, 2150 Shattuck Ave., Suite 903, Berkeley, California 94704

Date: ______________________ School: ______________________

BASIC DATA

1. TOTAL SCHOOL ENROLLMENT

If possible, please describe enrollment as of November 1, 1974.
If figures relate to other periods, specify dates under 1a and 2a below.

Total ________ Male ________ Female ________

Grade	Total	Male	Female
12th	____	___	____
11th	____	___	____
10th	____	___	____

9th	____	___	____

a. Date of above figures: ______________________

2. TOTAL SCHOOL ENROLLMENT BY ETHNIC GROUP

	Number
Total	____
American Indian	____
Black	____
Caucasian	____
Chicano or Latino	____
Chinese	____
Japanese	____
Other, specify:	____

____

____

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a. Date of above figures: ______________________

3. JUNIOR CLASS ENROLLMENT - FALL 1973

Total __________ Male __________ Female __________

4. SENIOR CLASS ENROLLMENT - FALL 1974

If possible, please describe enrollment as of November 1, 1974.
If figures relate to another period, specify date under 4a below.

Total __________ Male __________ Female __________

Ethnic Group	Number
Total	______
American Indian	______
Black	______
Caucasian	______
Chicano or Latino	______
Chinese	______
Japanese	______
Other, specify:	______

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____

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a. Date: ____

5. PERIODS OF SCHOOL DAY

a. Number ________________________________

b. Length ________________________________

6. POST SECONDARY EDUCATION OF YOUR SCHOOL GRADUATES

	Number	Percent
a. All school graduates	____	100
College-going	____	____
To 4 yr college or university	____	____
To state college	____	____
To junior college	____	____

b. Period or date to which estimates relate ____________________

c. Source of estimates ______________________________

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7. NUMBER OF THE SCHOOL'S MERIT SCHOLARS AS A PERCENT OF THE GRADUATING CLASS IN 1973.

No. of Graduates	No. of Merit Scholars	Percent of Graduating Class
Total ________	________	________
Girls ________	________	________
Boys ________	________	________

8. PLEASE NOTE ANY AVAILABLE DATA THAT YOU BELIEVE PROVIDE INDICATORS OF THE SOCIO-ECONOMIC CHARACTERISTICS OF YOUR SCHOOL'S STUDENT POPULATION, FOR EXAMPLE, APPLICATIONS FOR EOP.

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9. PLEASE DEFINE THE GEOGRAPHIC AREA FROM WHICH YOUR STUDENTS ARE DRAWN.

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PSAT #		CODE
	Mathematics, Statistics and Computer Science	04
62	Actuary	04090
	Computer Scientist	04091
25	Mathematician/Statistician	04092
	Teacher, Secondary--Mathematics, Statistics and Computer Science	04093
	Teacher, College--Mathematics, Statistics and Computer Science	04094
	Biostatistician	04095
	Other professional occupations--Mathematics, Statistics and Computer Science	04099
	Scientific-Technical-Mathematical Setting or Activity	05
61	Accountant	05100
56	City Planner	05101
	Research Worker, scientific-technical-mathematical	05102
	Teacher, Elem.--Spec. Ed. (e.g., emotionally disturbed, mentally retarded)	05103
	Teacher, Sec.--Sci-Tech-Math setting or activity (e.g., shop, bookkeeping, shop math)	05104
	Teacher, College--Sci-Tech-Math setting or activity (e.g., accounting, business administration, insurance)	05105
76	Teacher, Secondary or College--Physical Education	05106
	Technical Writer	05107
	Patent Attorney	05108
	Other professional occupations--Sci-Tech-Math setting or activity	05119
	Non-Scientific-Technical-Mathematical	08
30	Anthropologist, archaeologist	08120
66	Economist	08121
92	Political Scientist	08122
54	Sociologist	08123
94	Social Scientist, unspecified	08124
	Other social scientists	08129

PSAT #		CODE
77	Actor, actress, director	08130
	Athletes and kindred	08131
48	Artist (fine arts)	08132
57	Artist (graphic design)	08133
	Dancer	08134
78	Entertainer (radio and TV)	08135
86	Interior Decorator	08136
74	Journalist, writer	08137
47	Linguist, interpreter (translator)	08138
58	Musician (exc. teacher)	08140
	Photographer	08141
	Public relations person, writer	08142
	Radio, TV announcer	08143
	Media production--radio, TV, films	08144
	News reporter, analyst--radio, TV	08145
	Other artists, writers, entertainers, etc.	08149
29	Advertiser	08150
	Archivist and Curator	08151
69	Guidance counselor (education; and counselor, unspecified)	08152
51	Lawyer	08153
75	Librarian	08154
53	Minister, theologian, clergyman	08155
88	Personnel work (industrial)	08156
	Recreation worker	08157
	Research workers, non-scientific-technical-mathematical	08158
95	Social worker	08160
	Probation officer	08161
	Other professional occupations, non-scientific-technical-mathematical	08169

PSAT #		CODE
	Teacher, preschool	08170
42	Teacher, elementary unspecified	08171
46	Special school (or special education) teacher	08172
43	Teacher, secondary, unspecified	08173
	Teacher, secondary, non-sci-tech-math (exc. art or music)	08174
44	Teacher, college or univeristy, unspecified	08175
	Teacher, college or university, non-sci-tech-math (exc. art or music)	08176
68	Teacher, Art--secondary, college, private	08177
80	Teacher, Music--secondary, college, private	08178
45	Teacher, Religious--secondary or college	08180
40	Educator, teacher, unspecified	08181
52	Government service, politician	08182

PSAT #		CODE
	SEMI-PROFESSIONAL WORKERS--TECHNICIANS, TECHNOLOGISTS	1
	Technicians--Plants, Animals and related Life Sciences	10
	Technicians (Plants, Animals and related Life Sciences)	10189
	Technicians--Human, Medical and related Life Sciences	11
	Dental hygienist	11190
	Embalmer	11191
	Medical record technician, technologist	11192
	Licensed vocational nurse	11193
	Radiologic technician, technologist	11194
	Therapy assistants	11195
33	Medical technologist, unspecified (laboratory technicians)	11196
85	Health fields, unspecified	11197
	Other Technicians (Human, Medical, Dental and related Life Sciences)	11209
	Technicians--Physical Sciences	12
	Chemical technicians	12210
	Sound technicians	12211
	Other physical science technicians	12219
	Technicians--Engineering and Architecture	13
	Draftsmen	13220
	Surveyor	13221
	Other engineering and architectural technicians	13229
	Technicians--Mathematics, Statistics, Computer Sciences	14
59	Computer systems work	14230
	Programmer	14231
	Systems Analyst (exc. engineers)	14232
	Other mathematics, statistics, computer science technicians	14239

PSAT #		CODE
	Technicians--Scientific-Technical-Mathematical Setting or Activity	15
	Airplane pilot	15240
	Air traffic controller	15241
	Electrical and electronic technician	15242
	Flight engineer	15243
	Radio operator	15244
	Tool programmer, numerical	15245
	Other technicians--Scientific-Tech-Math setting or activity	15249
	Semi-professional, non-scientific-technical-mathematical	18
	Semi-professional, non-scientific-technical-mathematical	18259

PSAT #		CODE
	MANAGERS, OFFICIALS AND ADMINISTRATORS (EXCEPT FARM)	2
	Salaried:	
	Manufacturing:	
	Scientific-technical-mathematical	27260
	Non-scientific-technical-mathematical	28261
	Wholesale Trade:	
	Scientific-technical-mathematical	27272
	Non-scientific-technical-mathematical	28271
	Retail Trade:	
	Scientific-technical-mathematical	27262
	Non-scientific-technical-mathematical	28263
60	Business (management)	28264
84	Banking, brokerage, financial (management)	28265
65	Transportation (management)	27266
63	Hotel and restaurant (management)	28267
	Health Services (management)	27268
	Welfare Services (management)	28270
	Industries other than above:	
	Scientific-technical-mathematical	27279
	Non-scientific-technical-mathematical	28289
	Self-employed:	
	Retail trade:	
	Scientific-technical-mathematical	27290
	Non-scientific-technical-mathematical	28291
	Other Industries:	
	Scientific-technical-mathematical	27299
	Non-scientific-technical-mathematical	28309
67	Administrator (education, nonprofit organizations)	28310

PSAT #		CODE
	SALES WORKERS	3
	Manufacturing and Wholesale Trade:	
	Scientific-technical-mathematical	37311
	Non-scientific-technical-mathematical	38312
	Retail Trade:	
	Scientific-technical-mathematical	37313
	Non-scientific-technical-mathematical	38314
	Other Industries:	
	Scientific-technical-mathematical	37319
	Non-scientific-technical-mathematical	38329
93	Sales representative, unspecified	38330

PSAT #		CODE
	CLERICAL AND KINDRED WORKERS	4
	Bookkeepers	48331
	Secretaries, Stenographers, Typists:	
	Medical and public health secretaries	47332
	Other scientific-technical-mathematical secretaries, etc.	47339
	Non-scientific-technical-mathematical secretaries, etc.	48340
	Other clerical workers:	
	Bank tellers and related	48341
	Collectors--bill and account	48342
	Estimators	48343
	Insurance adjusters	48344
	Mail carriers and postal clerks	48345
	Payroll, timekeeping clerks	48346
	Real estate appraisers	48347
	Misc. clerical workers:	
	Misc. clerical workers--sci-tech-math	47349
	Misc. clerical workers--non-sci-tech-math	48359

PSAT #		CODE
	CRAFTSMEN, FOREMEN AND KINDRED	5
	Automobile mechanics, including body repairmen	57360
	Mechanics and repairmen, exc. auto:	
	Air conditioning, heating, refrigerating	57361
	Aircraft	57362
	Data processing machines	57363
	Heavy equipment, incl. diesel	57364
	Household appliances	57365
	Office machines	57366
	Radio, TV	57367
	Other mechanics and repairmen:	
	Scientific-technical-mathematical	57369
	Non-scientific-technical-mathematical	58379
	Machinists	57380
	Metal Craftsmen exc. machinists and mechanics:	
	Millwrights	57381
	Pattern and model makers	57382
	Tool and die makers	57383
	Other metal craftsmen:	
	Scientific-technical-mathematical	57389
	Non-scientific-technical-mathematical	58399
	Carpenters	
	Construction craftsmen except carpenters:	
	Electricians	57401
	Plumbers and pipe fitters	57402
	Structural metal craftsmen	57403
	Other construction craftsmen:	
	Scientific-technical-mathematical	57409
	Non-scientific-technical-mathematical	58419

PSAT #		CODE
	Other Craftsmen:	
	Printing trades	58420
	Transportation	57421
	Public Utilities	57422
	Miscellaneous craftsmen:	
	Dental laboratory technician	57423
	Watchmakers	57424
	Opticians, lens grinders, polishers	57425
	Stationary engineers	57426
	Other miscellaneous craftsmen:	
	Scientific-technical-mathematical	57429
	Non-scientific-technical-mathematical	58439
	Foremen	
	Scientific-technical-mathematical	57449
	Non-scientific-technical mathematical	58459
	Craftsmen, unspecified	58460

PSAT #		CODE
	OPERATIVES AND LABORERS EXCEPT FARM	6
	Operatives except Transport:	
	Manufacturing:	
	Scientific-technical-mathematical	67461
	Non-scientific-technical-mathematical	68462
	Non-manufacturing Industries:	
	Scientific-technical-mathematical	67463
	Non-scientific-technical-mathematical	68464
	Operative, unspecified	68465
	Transport Equipment Operatives:	
	Bus drivers	68466
	Truck drivers	68467
	Other transport equipment operatives:	
	Scientific-technical-mathematical	67469
	Non-scientific-technical-mathematical	68479
	Laborers:	
	Animal caretakers	67480
	Gardeners, groundskeepers	67481
	Longshoremen	68482
	Stockhandlers	68483
	Warehousemen	68484
	Other laborers:	
	Scientific-technical-mathematical	67489
	Non-scientific-technical-mathematical	68499

PSAT #		CODE
	FARMERS, FARM MANAGERS, FARM LABORERS	7
70	Farmer, rancher	77500
	Farm manager	77501
	Farm foreman	77502
	Farm laborer	77503

PSAT #		CODE
	SERVICE WORKERS	8
	Cleaning Service Workers	88504
	Food Service Workers	88505
	Health Service Workers:	
	Dental Assistant	87506
	Nurse Aid, Orderly	87507
	Other health service workers	87519
	Personal Service Workers:	
	Airline Stewardess	88520
	Attendant, Recreation and Amusement	88521
	Hairdresser, cosmetologist	88522
	Other personal service workers	88529
	Protective Service Workers:	
	Fireman, fire protection	88530
	Policeman and Detective	88531
79	Military:	88532
	Commissioned Officer:	
	Scientific-technical-mathematical	87533
	Non-scientific-technical-mathematical	88534
	Noncommissioned Officer:	
	Scientific-technical-mathematical	87535
	Non-scientific-technical-mathematical	88536
	Other Protective Service Workers	88539
	Other Service Workers except private household:	
	Scientific-technical-mathematical	87549
	Non-scientific-technical-mathematical	88559
	Service Workers, private household	88560

PSAT #		CODE
	Housewife	98561
99	Other	98562
90	Undecided	98563